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JULY 1952

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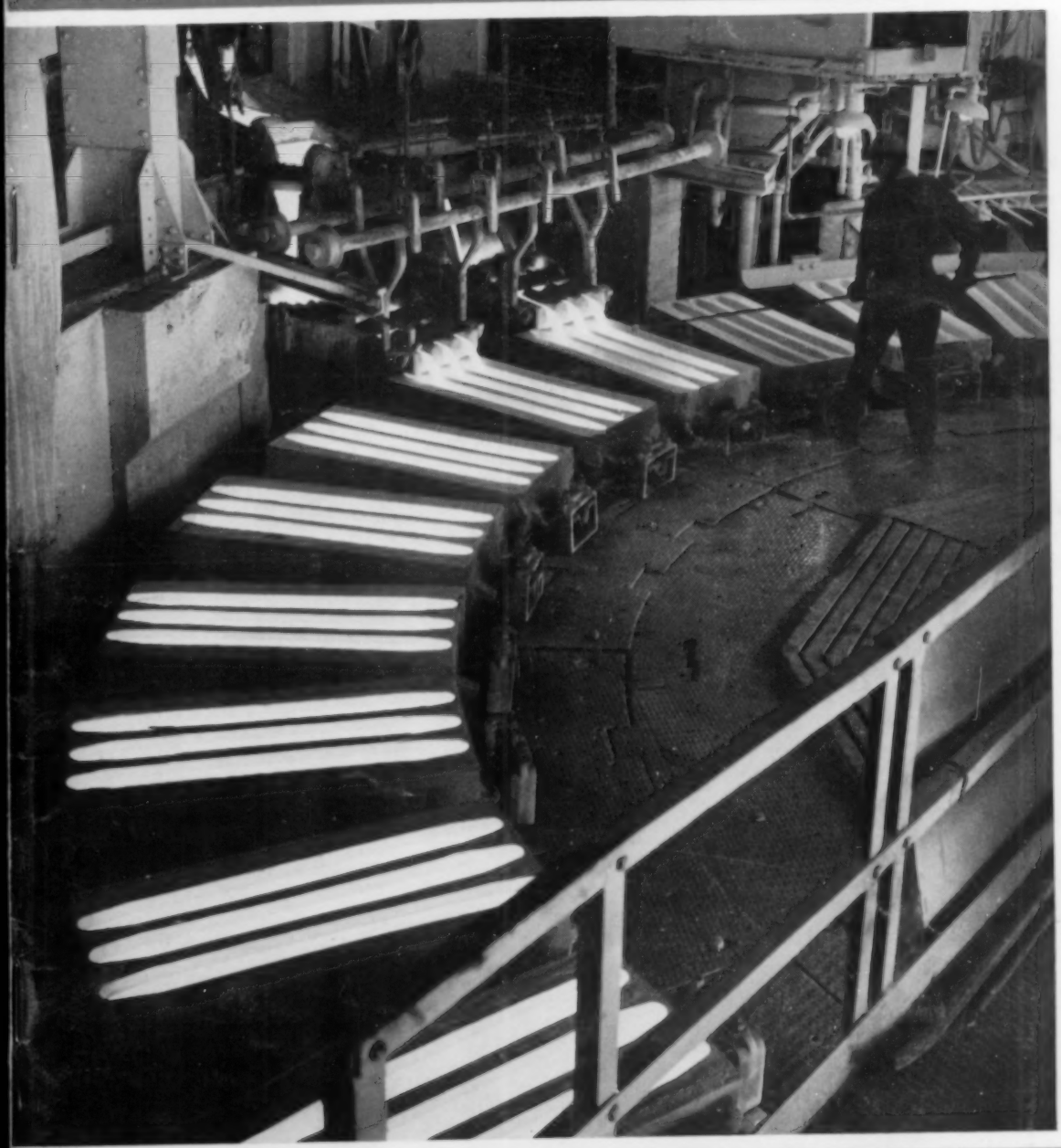


CASTING BARS OF COPPER FOR WIRE

Filling molds on revolving wheel in Anaconda refinery

VOLUME 57 • NUMBER 7

NEW YORK • LONDON

Air Casualties

It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.

The kind of air a man works in has a lot to do with how much work he can turn out.

In confined places like shipholds or tanks or drums or boilers . . . or wherever the air is stagnant or hot or full of fumes . . . a Coppus Blower is a *must* for getting first-class work out of the men, all the time.

A Coppus Blower or Exhauster helps avoid sickness and lassitude due to bad air . . . and improves morale, too.

Portable and adaptable for special purposes, Coppus Blowers and Exhausters will have dozens of uses around your plant. The "Blue Ribbon" (a blue painted band) is your assurance of quality performance at lowest cost.

COPPUS

BLUE RIBBON BLOWERS

THE BLOWERS THAT PUT MORE MINUTES IN EVERY MAN-HOUR

CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS . . . DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

MAIL THIS COUPON To Coppus Engineering Corp., 207 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets, etc., after treated with coating material.

NAME .....

COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)

STAYNEW

ABSORPTION FILTERS PROVIDE

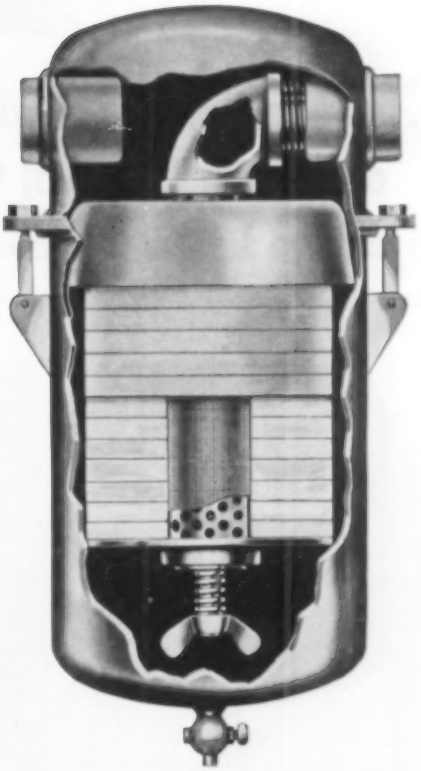
SUPER FILTRATION!

—REMOVE LAST TRACES OF OIL AND MOISTURE FROM COMPRESSED AIR LINES

The model AAPH Absorption Type Filter has proven itself to be the real answer to the elimination of costly service interruptions in utility and industrial power plants. Many manufacturing processes and certain compressed air operated equipment require the removal of condensed oil and water vapors *completely* from the compressed air. In thousands of installations all over the country, Staynew Absorption Filters remove the last traces of oil and moisture and prevent failure of combustion and other pneumatic controls . . . keep maintenance time and cost at a minimum.

For Complete Information, Write Today For Bulletin B-1A

Representatives in Principal Cities



MODEL AAPH
Absorption Filter

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER

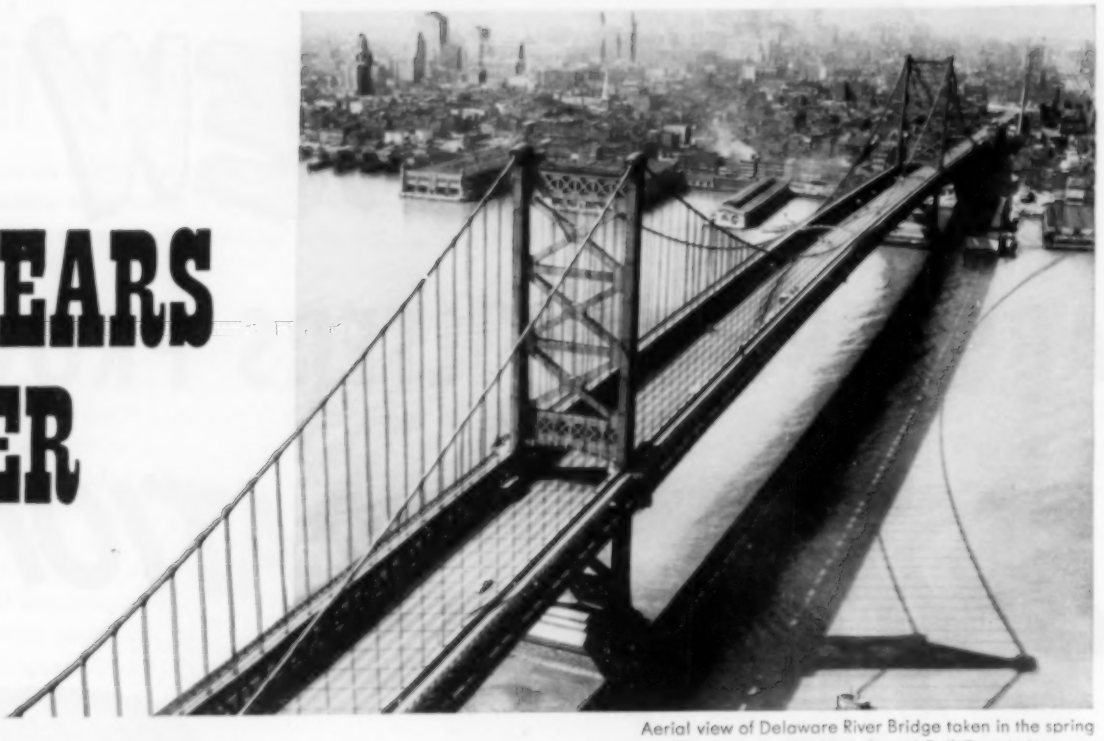
CORPORATION

7 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

IN CANADA: Toronto - McCarthy & Robinson, Ltd.
Montreal - Engineering Equipment Co., Ltd.
Vancouver - P. D. McLaren & Sons, Ltd.
Winnipeg - Mumford-Medland, Ltd.

15 YEARS LATER



Aerial view of Delaware River Bridge taken in the spring of 1952, showing the High Speed Rail Transit Lines on outer sides of bridge. Photo by Aero Service Corporation.

...a report on the service of Everdur Electrical Conduit on the Delaware River Bridge

In 1936, at the time of installation, the Transit Line rails were utilized to transport 20-foot lengths of Everdur Conduit to the cable runways.

The Delaware River Bridge, linking Camden, N. J. with Philadelphia, opened to vehicular traffic in July 1926. In 1934-36, when the High Speed Rail Transit Line was installed, more than 200,000 pounds, or 14½ miles of Everdur* Conduit, in nominal sizes from 1½" to 4", was used for electrification and electro-pneumatic signal operations.

Service conditions were anything but good—and the problems encountered included corrosive industrial gases and almost continual vibration caused by the rapid transit rail cars and 70,000 motor vehicles a day.

Now, with another bridge expansion project planned, an engineer of The American Brass Company made an "on-location" inspection of the 15-year-old installation. The detailed report concludes as follows:

> *"It is my opinion that the corrosion rate of the unpainted Everdur Conduit installed on the Delaware River Bridge is very low, and that the conduit will last as long as the bridge itself."*

Everdur Electrical Conduit is made of Everdur Copper-Silicon Alloy in two wall thicknesses (R.C. and E.M.T.). Publication E-12 describes this ANACONDA Product in detail. For a copy, address The American Brass Company, General Offices, Waterbury 20, Connecticut. 52165

*Reg. U.S. Pat. Off.

wherever corrosion resistance counts *consider*

EVERDUR ELECTRICAL CONDUIT

a product of

ANACONDA®

Lead-Zinc Mining in Utah—Bethlehem Hollow teams up with carbide-tipped bits on the 1500-ft level of the Mayflower Mine of New Park Mining Co. This jumbo-mounted drifter puts in 6-ft holes through abrasive sulphide ore bodies.

Dam Building in Northwest—Excavating work at the site of Chief Joseph Dam on the Columbia River called for more than 100 tons of Bethlehem Hollow. This is a recent addition to the long list of big projects where this "old reliable" of drill steels has had the responsibility for keeping drilling on schedule.

Buffalo Underpass Job — Rock drilling doesn't stop for chilly weather in Buffalo. Here Bethlehem Hollow bores into hard, flint-streaked rock on an excavating job that removed 70,000 cu yd of rock on a four-lane underpass contract.

Steel that chews rock from Vermont to California

Deep-holes, short-holes. Hard, abrasive ore . . . basalt . . . dolomite. Steel bits . . . bits with carbide inserts.

Whatever the depth of hole, type of rock, or style of detachable bit, there's one hollow drill steel that does the job from coast to coast, and does it well. It's Bethlehem Hollow.

Make sure you've got this old reliable on the job!

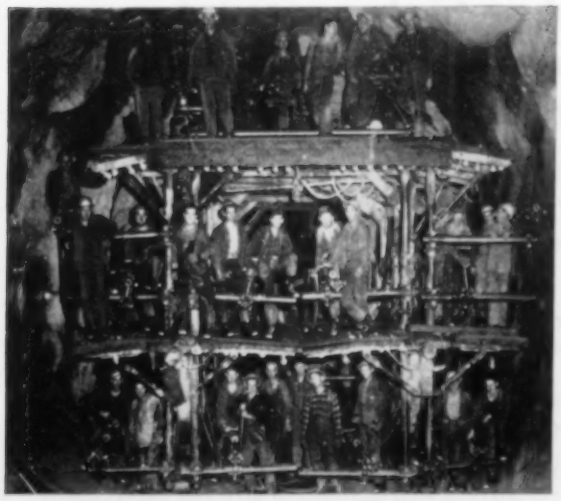
IMMEDIATE DELIVERY

Bethlehem Hollow Drill Steel is ready to ship from our mill depot in all popular sections and sizes. Also available from local converters. And if you need solid drill steel, quarrying steels, auger drill steel, or steel for stone-dressing tools . . . remember to specify Bethlehem. Each steel is engineered to give a lot of service.

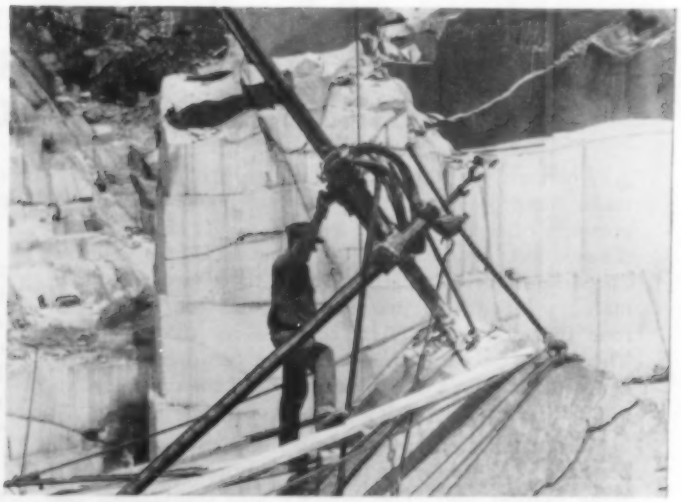
BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



California Tunnel Project—Here's the three-story drill carriage and one of the crews that smashed three records for driving large-diameter tunnels. Big Creek Project No. 4 was the scene of this outstanding performance of Bethlehem Hollow.

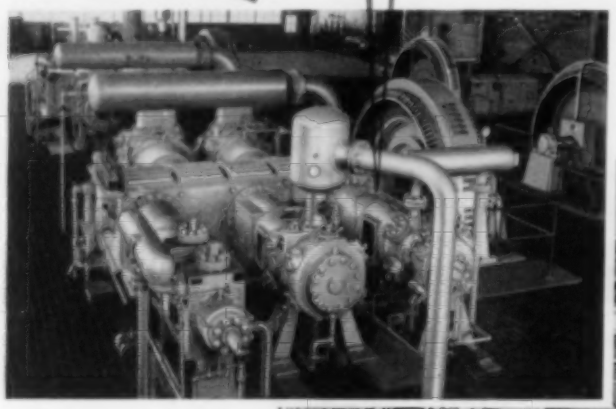


Quarrying Vermont Granite—A real test of drill-steel quality is provided by "Rock of Ages," a hard, dense-grained granite. This rock drill, using Bethlehem Hollow, is mounted on a movable saddle so that a line of holes can be drilled in perfect alignment. Quarries everywhere rely on Bethlehem Hollow.

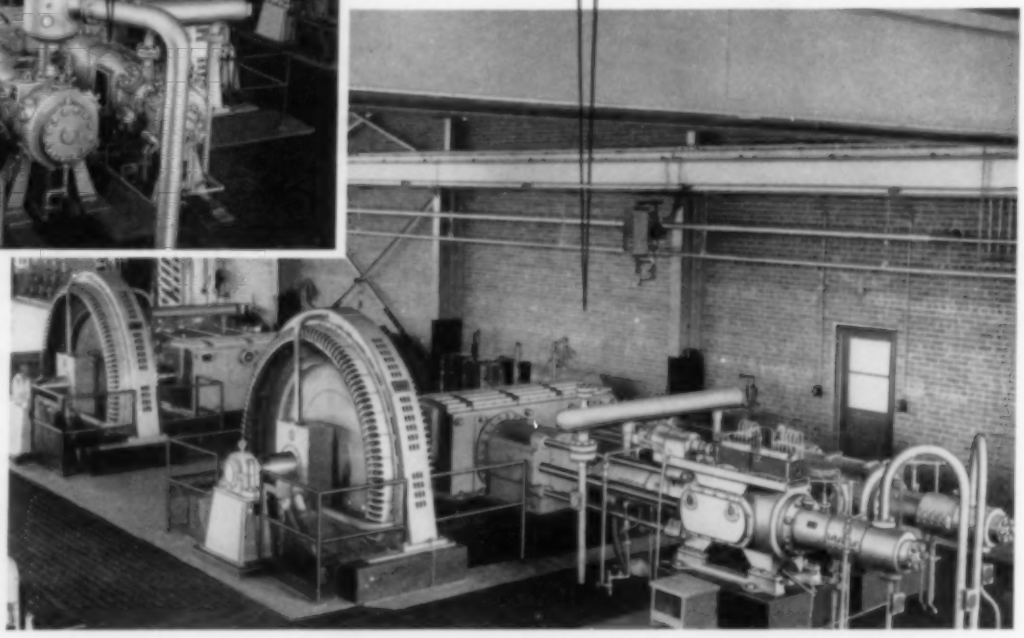
BETHLEHEM HOLLOW DRILL STEEL

Nitrogen and Hydrogen Compressed to 15,000 psi pressure

for making Synthetic Ammonia



Two 4-stage HHE primary compressors discharge hydrogen-nitrogen mixture at 3500 psi. Each is driven by a 2250-hp synchronous motor.



Further compression to 15,000 psi is accomplished by the two 900-hp boosters at right. These are two-stage HHE units.

Ingersoll-Rand solves another high-pressure problem...with new HHE compressor installation at Mississippi Chemical Corporation

When nitrogen and hydrogen are brought together under the proper condition of pressure and heat in the presence of a catalyst, the reaction yields ammonia. In the synthetic ammonia plant of the Mississippi Chemical Corporation, at Yazoo City, Miss., these two gases are mated at 15,000-psi pressure . . . with the aid of the four Ingersoll-Rand HHE compressors shown above. The plant's output is used largely as fertilizer, although synthetic ammonia is also an important chemical used to make high explosives.

This installation has two trains of compression, each consisting of a four-stage primary compressor and a two-stage booster unit. The primary unit compresses the nitrogen-hydrogen mixture from 9 psi to 3500 psi, discharging to the intake of the booster unit which completes the compression to 15,000 psi.

The application of high-pressure compressors like these has been one of Ingersoll-Rand's major contributions to process industries. For various synthetic-ammonia processes alone I-R has built successful high-pressure compressors totalling more than 170,000 horsepower. Eight of them were for 15,000 psi; the remainder for pressures from 3,000 to 5,000 psi. The first units are still in operation after 27 years of service at 4500 psi.

If you have a process-compressor problem, your I-R representative is well qualified to give you expert assistance, no matter what the gas, pressure, or process.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS • DIESEL & GAS ENGINES

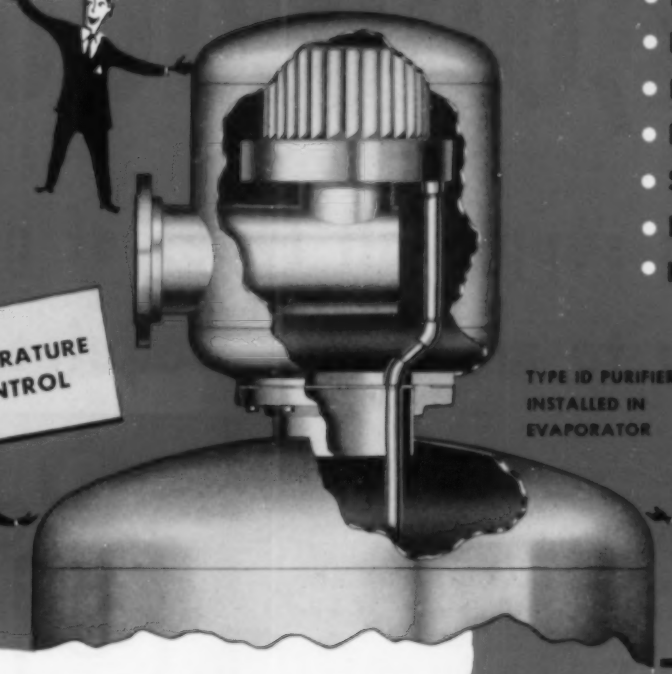
Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y. 787-1

What are you doing about the *third control?*

3 ENTRAINMENT CONTROL

2 TEMPERATURE CONTROL

1 PRESSURE CONTROL



TYPE ID PURIFIER INSTALLED IN EVAPORATOR

on
- STEAM DRUMS
- FLASH TANKS
- EVAPORATORS
- PACKED TOWERS
- DEODORIZERS
- STILLS
- BUBBLE-CAP TOWERS
- RECEIVERS

• Frequently you give serious thought and attention to *pressure* and *temperature control.* This is quite natural because it means better operation and more production and often prevents damage. But what about the *third control—entrainment control.* Lack of this control can be just as costly as lack of pressure and temperature control.

Lack of the third control can mean shut downs and loss of production due to entrainment wear in engines and process equipment. Larger slugs of entrainment have been known to blow off cylinder heads of reciprocating engines and to ruin thrust bearings of turbines.

Lack of third control means poor efficiency of superheaters, steam ejectors, dryers and other equipment. It means dirty pipe lines and fouled valves.

End this damage *once and for all* with Hi-eF Purifiers. They remove 99% of all entrainment. Individually guaranteed, Hi-eF Purifiers are the most economical protection you can buy . . . they cost no more than an ordinary separator. Write us today about your entrainment problem. Let our engineering staff, without the slightest obligation, give you the proper solution.

ANDERSON Hi-eF PURIFIERS

DOWNFLOW INTERNAL PURIFIER

PURIFIER DIVISION,

THE V. D. ANDERSON COMPANY

1996 West 96th Street • Cleveland 2, Ohio

Gentlemen: Please send additional information on Anderson Hi-eF Purifiers.

Name _____

Company _____

Address _____

City _____ Zone ___ State _____

1 gasket or 1,000,000

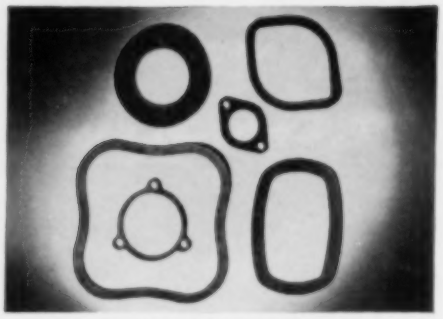
GARLOCK can supply all types of gaskets in *any* quantity to meet your requirements.

GARLOCK has the facilities to die cut, hand cut, mold, or machine all sizes and shapes of gaskets in *any quantity*. Yes, whether you are a small or big user, Garlock can supply you with the proper gaskets made accurately to your blueprint specifications or template.

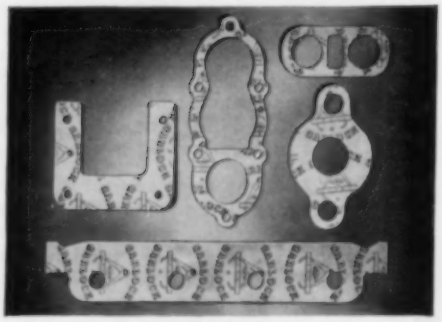
There's a Garlock gasket that answers your every requirement efficiently and economically. Some of the most widely used Garlock gasketing materials are:

- Compressed Asbestos with rubber, neoprene or buna-N binder
- Woven Asbestos
- Rubber—plain, cloth inserted or wire inserted
- Neoprene—plain or cloth inserted
- Buna-N
- Thiokol—plain or cloth inserted
- Silicone—plain or cloth inserted
- "Teflon"
- Vegetable Fibre
- Cork-Fibre
- Asbestos—metallic
- Leather

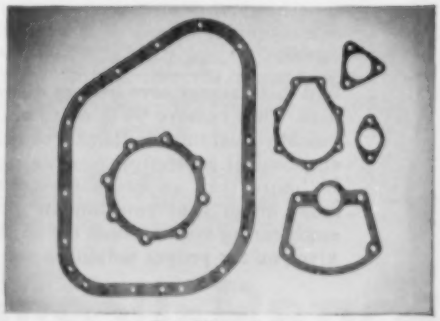
Let your Garlock representative help you solve your gasketing problems—call him today.



Compressed Asbestos Gaskets



Rubber Gaskets



Cork-Fibre Gaskets

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

Louis A. Stiles, Supt. and M. Gallup
of G. L. Tarlton Contracting Co.

G. L. TARLTON CONTRACTING CO.
WEST PARK AT MANCHESTER AVENUE
ST. LOUIS 10, MISSOURI

P. O. Box 494
Fort Collins, Colorado

April 11, 1952

The Eimco Corporation
P. O. Box XX
Salt Lake City 10, Utah

Attention: Ewald Kipp

Gentlemen:

As you know we have just established a new worlds record of 111' in 24 hours of tunnel driving at tunnel No. 4 of the North Poudre supply tunnels.

We attribute our success to excellent supervision, the good teamwork of our crews, the good drilling and the dependability of the equipment.

All of the loading was done with Eimco Model 21 loaders, in our estimation the absolute dependability of this equipment was a major factor in making this record possible.

The men responsible for this record are Louis A. Stiles Superintendent, Arthur Stiles walker, Clinton O. doss, Loren Huffaker and Ray Hooper shifters and Howard Carter, William Coley, and James Doggett mucking machine operators.

The tunnel is the Bureau of Reclamation semi-elliptical design 10 feet in the rough 8 foot finished. 13 ten foot rounds were made in the 24 hour period netting 111 feet. Somewhat less than 2 hours per complete round. 36 holes per round were drilled, 111.5 lbs of powder were used per round.

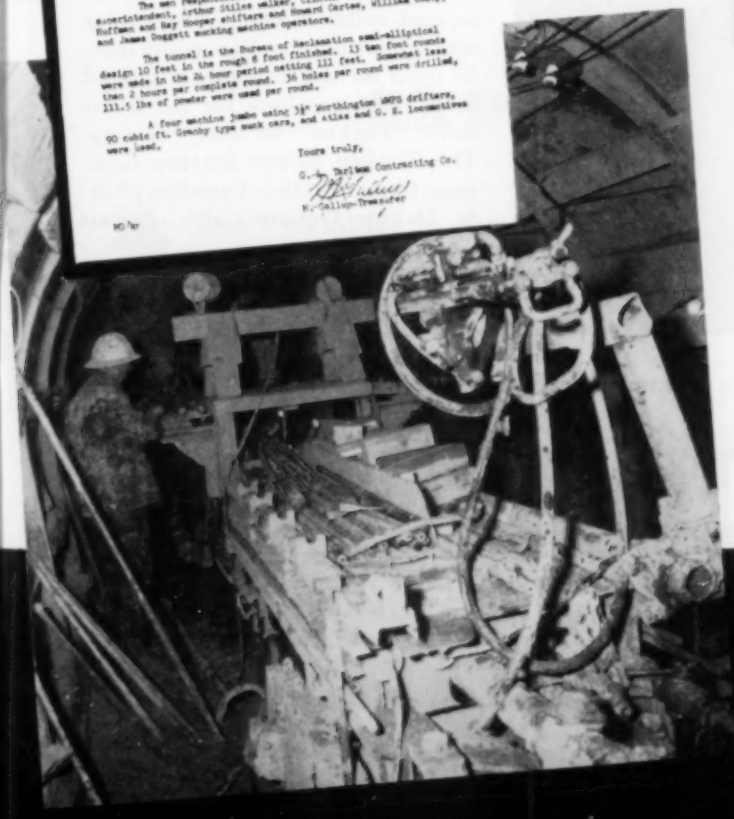
A four machine jumbo using 3½" Worthington 60% drifters, 90 cubic ft. Granby type mucK cars, and Atlas and G. E. locomotives were used.

Yours truly,

G. L. Tarlton Contracting Co.

M. Gallup-Treasurer

MG/kr



A NEW WORLD'S RECORD FOR HIGH SPEED TUNNELING

The G. L. Tarlton Company, contractors for U.S.B.R. on the North Poudre Supply Tunnel, drove 111 ft. of 9′ 4″ semi-elliptical tunnel in 24 hours, April 10, 1952; thus establishing a new world's record for footage driven in 24 hours, and beating the old record by more than 6 feet. The loading job was done by Eimco Model 21 Loaders. Other specifications of the job follow: Average depth of round drilled — 10′; Steel — all 10′ lengths; Bits — carbide insert, detachable type; Drills — 4 at face, 1 spare; Cars — 91 cu. ft. granby type; Holes per round — 36; Rounds this day — 13; Time of rounds, average — 35%—Drilling, 15%—Loading, 15%—Powder fumes exhausting, 35%—loading; Formation — Sundance Sandstone, Lykins formation.

EIMCO

4381

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES – SALT LAKE CITY 10, UTAH, U. S. A.

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NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
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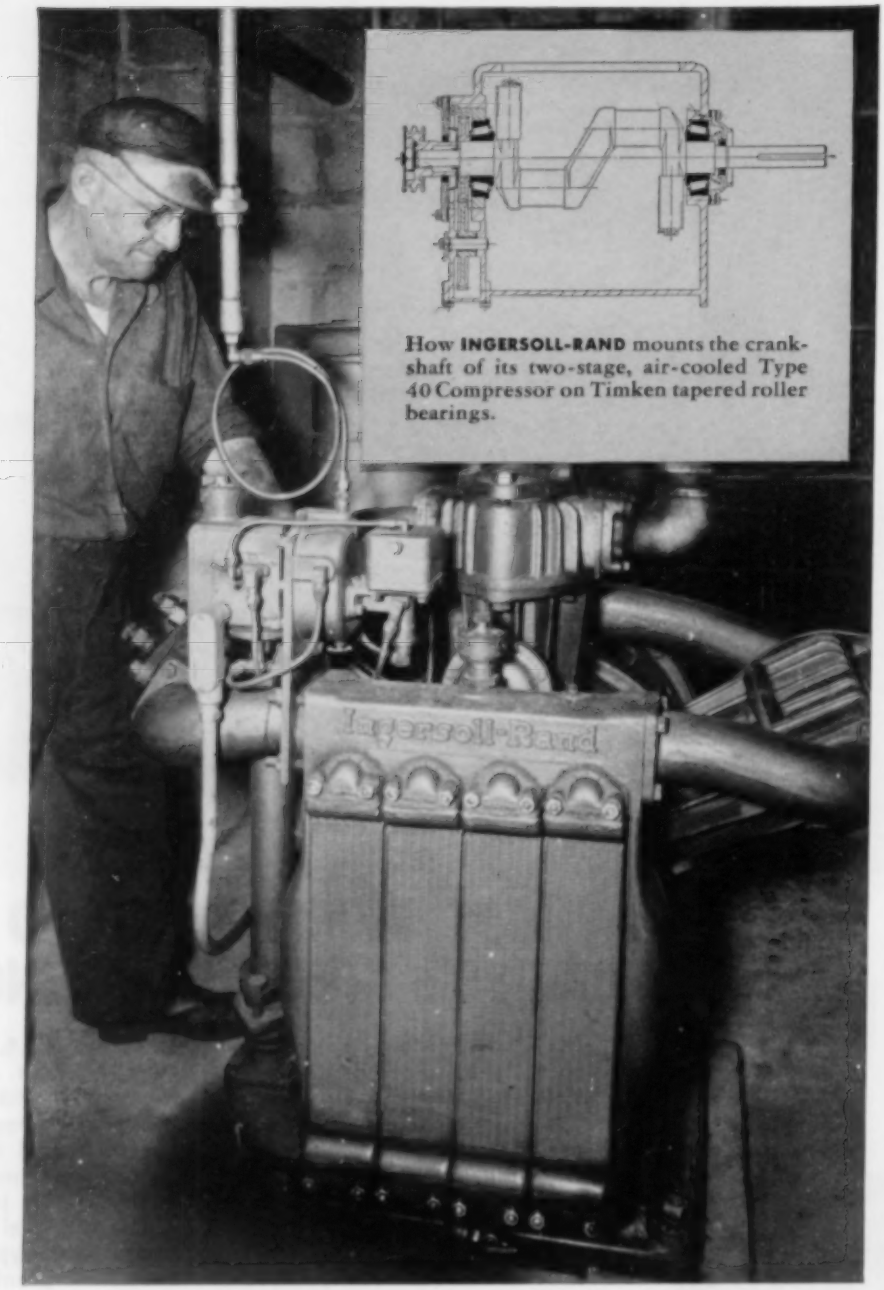
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 637 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

How to help a riveting hammer beat down operating costs



How **INGERSOLL-RAND** mounts the crankshaft of its two-stage, air-cooled Type 40 Compressor on Timken tapered roller bearings.

SHOWN in operation at the Madesco Tackle Block Company, Eastern, Pa., this Ingersoll-Rand Type 40 Compressor supplies air for riveting hammers and other pneumatic tools. To prevent costly breakdowns and maintenance delays, the compressor's crankshaft is mounted on Timken® tapered roller bearings.

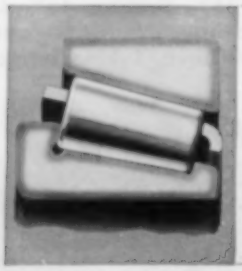
Due to their tapered construction, Timken bearings take both radial and thrust loads in any combination. Line contact between the rollers and races of Timken bearings provides extra load-carrying capacity. As a result, the crankshaft is held in positive alignment, practically eliminating deflection and end-play. Wear on moving parts is reduced, maintenance and repair time are minimized.

Timken bearings make closures more effective by keeping housings and shaft concentric. Lubricant is kept in—dirt and moisture are kept out.

The true rolling motion and incredibly smooth finish of Timken bearings make friction negligible. And Timken bearings will normally last the life of the compressor because they're (1) engineered for the job, (2) precision manufactured, (3) made of Timken fine alloy steel.

Over 50 years of bearing research and development have made Timken tapered roller bearings first choice throughout industry. Be sure you specify them for the machines you build or buy. Always look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



GREATER LOAD AREA

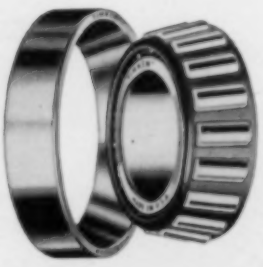
Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←

PROGRESS IN EXPLOSIVES . . .

EXPLOSIVES PARADOX

Don't be misled by the "old style" mule. This is a scene at an up-to-date dynamite plant. "New style" is the modern air conditioning equipment shown in the background.

Air conditioning enables Hercules to control atmospheric conditions while the dynamite is being packaged behind the barricade. In other words, it keeps your powder dry.

This is another example of Hercules pioneering that gives you better made explosives with better blasting efficiency.

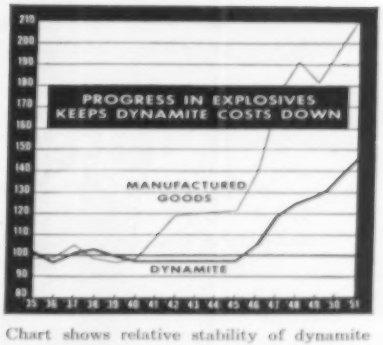


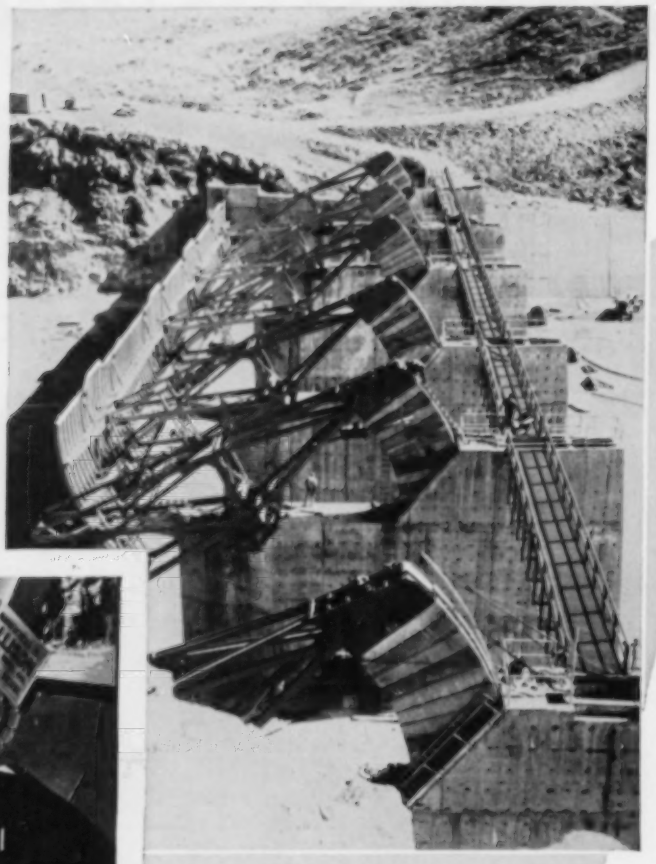
Chart shows relative stability of dynamite prices since 1935, as compared with prices of other manufactured goods. 1935-39 values = 100.

HERCULES POWDER COMPANY

INCORPORATED

Explosives Department, 932 King St., Wilmington 99, Del.

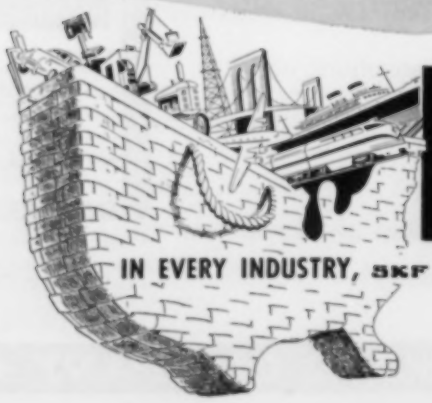
XR52-5



ENGINEERING
Swings 140-Ton Gates on SKF SPHERICAL ROLLER BEARINGS

At Phoenix, Arizona's Horseshoe Dam, they control the flow of water by means of three 140-ton self-adjusting radial-type gates. The gate designers, Leeds, Hill & Lewett, and the builders, Allison Steel Mfg. Co., developed a method of erection by which each gate arm could be placed in position and secured in two hours. That's *engineering*. Each gate arm pivots on two SKF Spherical Roller Bearings, each of which can support an 800,000-pound radial load, the kind of heavy duty for which SKF Sphericals are ideal. *That's real engineering, too.*

Designers of machinery and equipment in *every* industry have learned to depend on SKF engineering assistance to help them put the right bearing in the right place. Where they have the problem of very heavy combined radial and thrust loads, for example, they turn to SKF Spherical Roller Bearings. The teamwork between machine designers and SKF engineers produces advanced, dependable equipment **SKF INDUSTRIES, INC.,** PHILADELPHIA 32, PA. — *manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.* 7324



SKF®
BALL AND ROLLER BEARINGS

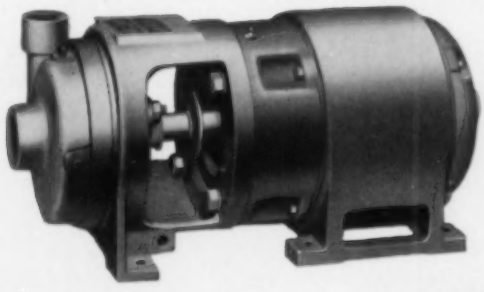
IN EVERY INDUSTRY, SKF Puts The Right Bearing In The Right Place

IMMEDIATE SHIPMENT

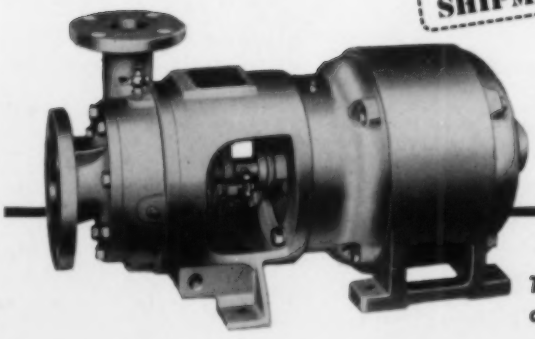
...OF I-R MOTORPUMPS

IMMEDIATE SHIPMENT

IMMEDIATE SHIPMENT



IMMEDIATE SHIPMENT



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ON THE COVER

THE largest single user of copper is the maker of electrical wire. The starting point of wire is bars of refined metal that are cast in forms on a revolving fixture. Our cover picture shows a casting wheel employed by International Smelting & Refining Company, of Perth Amboy, N.J., to prepare billets for the American Brass Company and Anaconda Wire & Cable Company. All three concerns are subsidiaries of Anaconda Copper Mining Company.

IN THIS ISSUE

GRASSE, a town in France, is probably one of the best-smelling places on the globe. It is a center for the manufacture of essential oils that are the base of perfumes. Many of the 25,000 inhabitants either raise the flowers that yield the oils or work in one of the many distilleries that process them. The perfumery industry is an old one, but it is learning some new tricks, as our leading article tells.

NATURE made the cactus tasty to cattle but clothed it in spiny armor to fend off foragers. Man's ingenuity comes to the rescue of the animals, however, and denudes the growth of its thorns to provide both food and drink for thousands of cows in the Southwest every year. The technique is explained by W. J. Kearns. Page 190.

MAN cannot yet compete with birds in soaring, but he does pretty well for a beginner. Motorless planes are useful in the study of areodynamics and also a source of pleasure and sport for thousands of enthusiasts. Page 196.

GREGARIOUS Americans lead the world in attending conventions and trade gatherings, so it is not surprising that we have some commodious accommodations for such affairs. One of the greatest is Atlantic City's Convention Hall, a structure that can shelter more people than reside in the New Jersey resort city. Page 199.

CORRECTION

IN THE article, *Tunnel Driving in France*, May issue, it was stated in the first column on page 128 that "an average of 21 pounds, 14 ounces of explosives is used per cubic yard of material." This should have read: "2 pounds, 14 ounces."

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G. W. MORRISON, *Publisher*
C. H. VIVIAN, *Editor* J. W. YOUNG, *Director of Advertising*
ANNA M. HOFFMANN, *Associate Editor* J. J. KATARBA, *Business Mgr.*
J. C. PIERCE, *Assistant Editor*
A. W. LOOMIS, *Assistant Editor*
D. Y. MARSHALL, Europe, 243 Upper Thames St., London, E. C. 4.
F. A. MCLEAN, Canada, New Birks Building, Montreal, Quebec.

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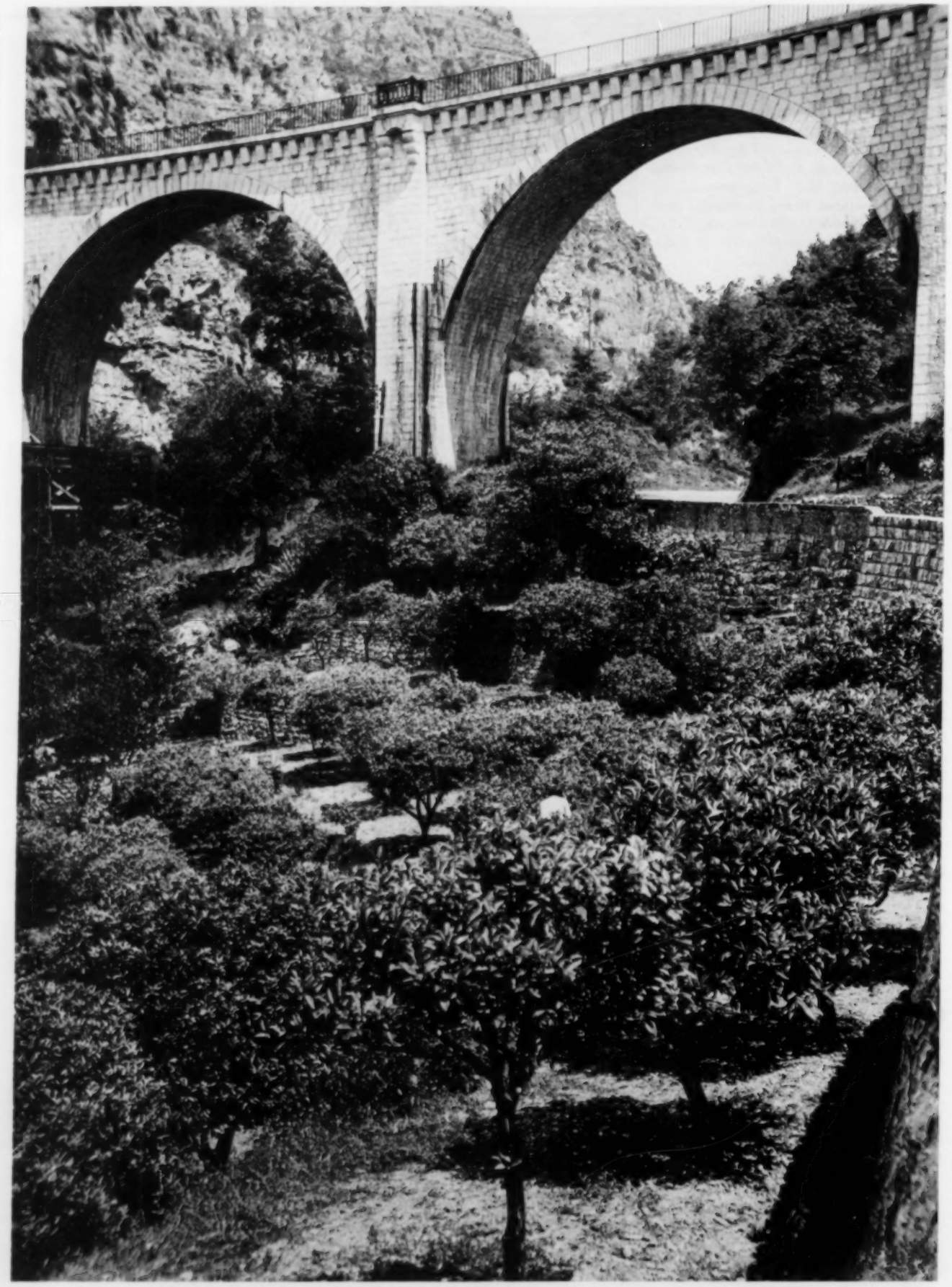


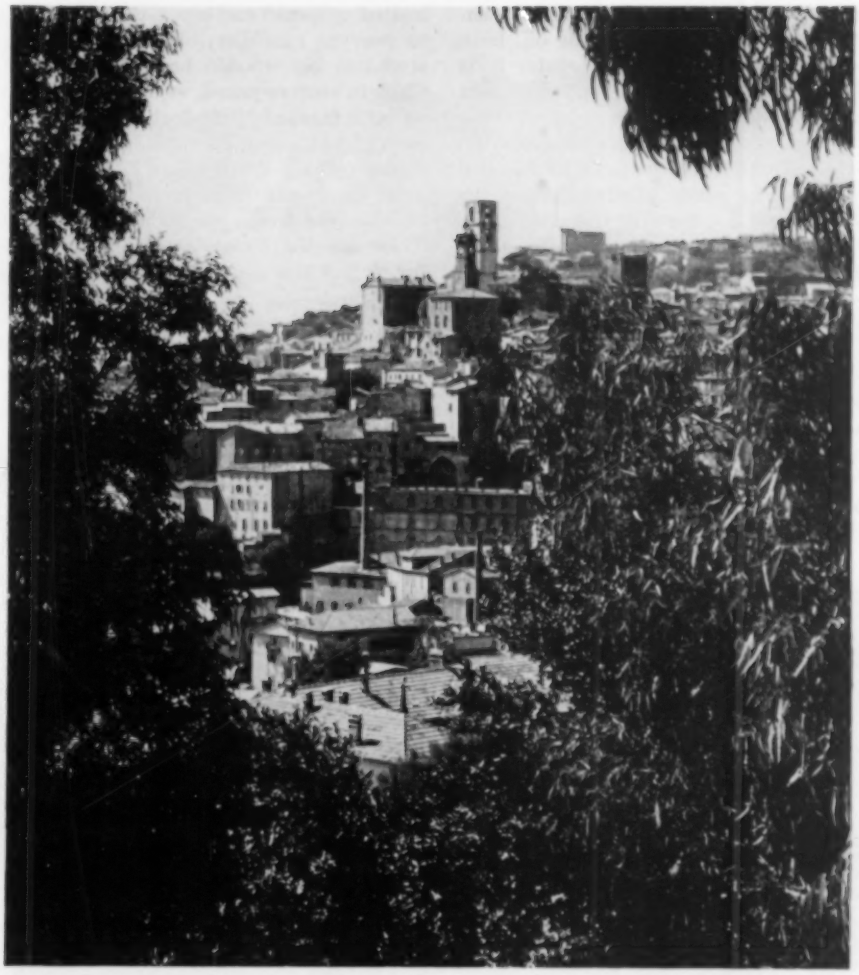
ORANGE GROVE

As a source of aromatic oils for perfume bases, orange blossoms rank first in the Grasse area, with a harvest in 1950 of 1100 tons. Shown here is a grove with a picturesque masonry bridge as a background.

Taking the Fragrance from Flowers

New Methods of Extracting Essential Oils from Plants Introduced in France

G. J. Constantini



GLIMPSE OF GRASSE

The stacks in the lower central area mark the location of one of the city's twenty distilleries that produce essential oils for perfumes. The flowers are Grasse tuberoses.

PERFUME making is one of the world's oldest industries and, strange as it may seem, the methods of extracting the essential oils from flowers and other plant organisms have varied but little during the centuries. However, a new process that uses butane as a solvent is attracting attention and promises to bring about important changes in the art and to provide new perfumes to gratify the sense of smell.

The principle of distillation was first applied in China and India more than 2000 years ago. From there, news of the discovery was carried to Persia and Egypt and then to the Greeks and Romans. At the fall of the Roman Empire, the Arabs began to study the subject and greatly improved upon the methods of extraction.

During the eleventh and thirteenth centuries, perfumes were brought to Europe by the Crusaders returning from their expeditions in the Holy Land. The fragrant essences won immediate popularity, and the demand for essential oils grew. Numerous distillation plants were established throughout France and Italy, and at the end of the sixteenth century the industry was firmly established on a large scale in Provence and Languedoc, provinces located in southern France on the Mediterranean. In 1590 ninety-one different essential oils were already known, and the use of alcohol as a means of extraction was introduced. In the following 300 years perfumers made notable progress in operating and managing their plants and were continuing their search for new essential oils. However, the process of distillation remained much as it had been in the Middle Ages.

Finally, at the close of the nineteenth century, things took another important turn with the importation of tropical products such as patchouli, vetiver and ilang-ilang that made it possible to place exotic fragrances on the market. Wellnigh at the same time a group of French scientists worked out a new method of extraction based on the use of volatile solvents. The results of their studies and theories were promptly applied in several distilleries in southern France and constituted a significant step forward in the perfume industry. Now we come to the latest development in 1950—the introduction of butane and the confirmation that it is one of the best means of extracting the essential oils from flowers, leaves, bark, wood, roots and other vegetable organisms.

The scent of fresh flowers is natural perfume of the highest order and is attributable to minute traces of essential oils in the petals. In the rose and lavender, for example, it is in the free state, but in the tuberose and jasmine it is in the form of glucoside. These oils are obtained in three ways: by steam distillation and by extraction with either nonvolatile or volatile solvents. In the case of the first-named process, the odoriferous material is boiled in a closed apparatus with water, the amount of the latter used varying from one to five times the quantity of flowers being treated. Or live steam may be blown through the material. One way or the other, the steam, carrying with it fine particles of essential oil, passes through a condenser to a vessel in which the oil, being lighter than the water, floats to

the top and is separated. As the drawn-off water always carries some oil, both in the free and dissolved state, it is usually put back in the boiler or sold as toilet water.

Steam distillation is undoubtedly the oldest method of extraction and is still practiced in many plants, though the present trend is towards the more modern processes. Furthermore, many kinds of flowers cannot be exposed to steam either because their content of essential oil is too low or their natural aroma is altered—impaired—by heat. They are generally treated by the method based on the use of nonvolatile solvents such as greases and oils, which absorb their natural perfumes.

The fatty compounds are made up of one part hard and of two parts soft materials which are thoroughly mixed, washed, melted, screened and especially prepared to prevent rancidity. The material is stored in big wooden boxes lined with tinplate until required, when it is spread on both faces of 20x25-inch glass plates, each of which is supported by a wooden frame termed a chassis. The coating must be 3 mm (0.04 inch) thick, and both layers weigh around one pound. Then selected flower petals are spread lightly on the fat and the frames are piled on top of one another. After 24 to 72 hours, depending upon the blossoms, the exhausted petals are replaced by fresh ones and the plates are turned upside down. This performance is repeated from 25 to 30 times. When each plate has been exposed to from 2 to 3 pounds of flowers, the compound, which has absorbed their fragrance, is removed and melted in big washtubs. The perfumed fat, now called pomade, is stored in wooden boxes similar to those in which it was kept before treatment.

GRASSE GARDENS

Daffodils and jasmine. Many of the community's gardens are small and belong to individuals who sell the flowers to the distilleries.

A different process is sometimes used with materials whose aroma is not spoiled by heat. They, together with the fat, are placed in big vats and subjected to a temperature ranging from 120 to 160°F. The mixture must be stirred continually for one to two hours, after which new flowers are added. This operation, known as maceration, is repeated from ten to fifteen times. Whether obtained by the cold or the hot method, the pomades may be employed as they are to make cosmetics, for example. But in most cases they are purified by mixing them with alcohol in large vessels and subjecting them to a temperature of 5°F. The resultant product, from which all fatty particles have been screened, is usually concentrated under low pressure to facilitate handling it.

Extraction with nonvolatile solvents gives excellent results and is used wellnigh exclusively in Grasse, France, which may be considered the world's leader in the production of essential oils. It takes skilled labor and a lot of capital to run such a plant. Some of the more important ones carry a stock of 100,000 frames. The plates of glass must be handled with care, and if the fats and pomades are stored in places that are not well ventilated they may become rancid. These disadvantages induced the Grasse perfumers to look around for a less costly and more reliable method.

Up to 1950 the industry generally used petroleum ether, benzene, acetone and toluene as solvents. However, others had been tried, and as far back as 1880 a French scientist named Naudin had recommended butane. In 1947, E. P. Meunier of the Centre d'Etudes et de Recherches du Pétrole investigated Naudin's theory and proved that butane was far superior to all the volatile solvents applied up to that time for the extraction of essential oils.

The process is a simple one and permits condensation of the solvent for recirculation. The flowers are spread on perforated plates in a series of hermetically sealed cylinders having a capacity of 18 to 54 cubic feet. The solvent, in gaseous form, is forced up through the vessels three times by a compressor. From there the gas, saturated with the essential oil, first flows through separators for the removal of any entrained moisture and impurities and then through a cooler where it is condensed. The resultant liquid is transferred by a small pump to a still where the essential oil is separated from the solvent by distillation. The liquid solvent is pumped back into the storage tank, while the residual solvent in the essential oil is extracted by steam injection. Finally, the fragrant essence is purified with al-

PURVEYORS OF PERFUME

Coty's manufacturing plant at Suresnes on the fringe of Paris and Paris retail stores of leading world perfumers. All French perfume makers use essential oils from Grasse. The different fragrances of the many and varied perfumes are obtained by mixing natural or artificial essential oils, but the exact compositions are well-guarded secrets.

cohol and concentrated under low pressure.

The equipment required is rather heavy and complicated, but it gives excellent results. The vegetable organisms are never damaged, and it is therefore possible to obtain essential oils whose fragrances are exactly the same as those of the raw materials from which they were extracted. By still another method the flowers are arranged in baskets which are suspended from a large wheel and plunged repeatedly into the volatile butane in a closed vessel. Other than that the treatment of the saturated solvent proceeds as just outlined.

As the best essential oils are obtained at low temperatures, it is obvious that butane has a great advantage over all the other volatile solvents. At atmospheric pressure its boiling point is only 30°F, as compared with that of petroleum ether, for instance, which is 160°. This means that butane can be vaporized with steam at 64°, as against 212° in the case of petroleum ether. Furthermore, butane makes it possible to extract the essential oils from such flowers as lily of the valley and lilac that did not respond to any of the other solvents, whether nonvolatile or volatile. The industry therefore has new fragrances at its disposal from which to create perfumes of the finest quality. The butane is stored in a gasholder and handled by an Ingersoll-Rand compressor that was especially designed for this work in order not to spoil the delicate essential oils, the value of which is estimated roughly at $600 a pound.

It is interesting to note that all the improvements in the perfume industry were first tried out and applied in Grasse, a town of not more than 25,000 inhabitants located in the heart of Provence 10 miles from the French Riviera. Protected as it is from the northern winds by the last spurs of the Alps, and receiving the full benefits of the sun and the mild Mediterranean weather, it is exceptionally well situated for the growing of flowers.

Grasse was settled more than 2000 years ago and, according to the old records, a Florentine named Tombarelli built a distillery there in 1595. Actually, however, it was not until the seventeenth or eighteenth century that the business became fairly well established. Now, many different kinds of plants are cultivated on the surrounding hills to supply twenty distilleries employing more than 2000 workers—nearly one-tenth of the local population.

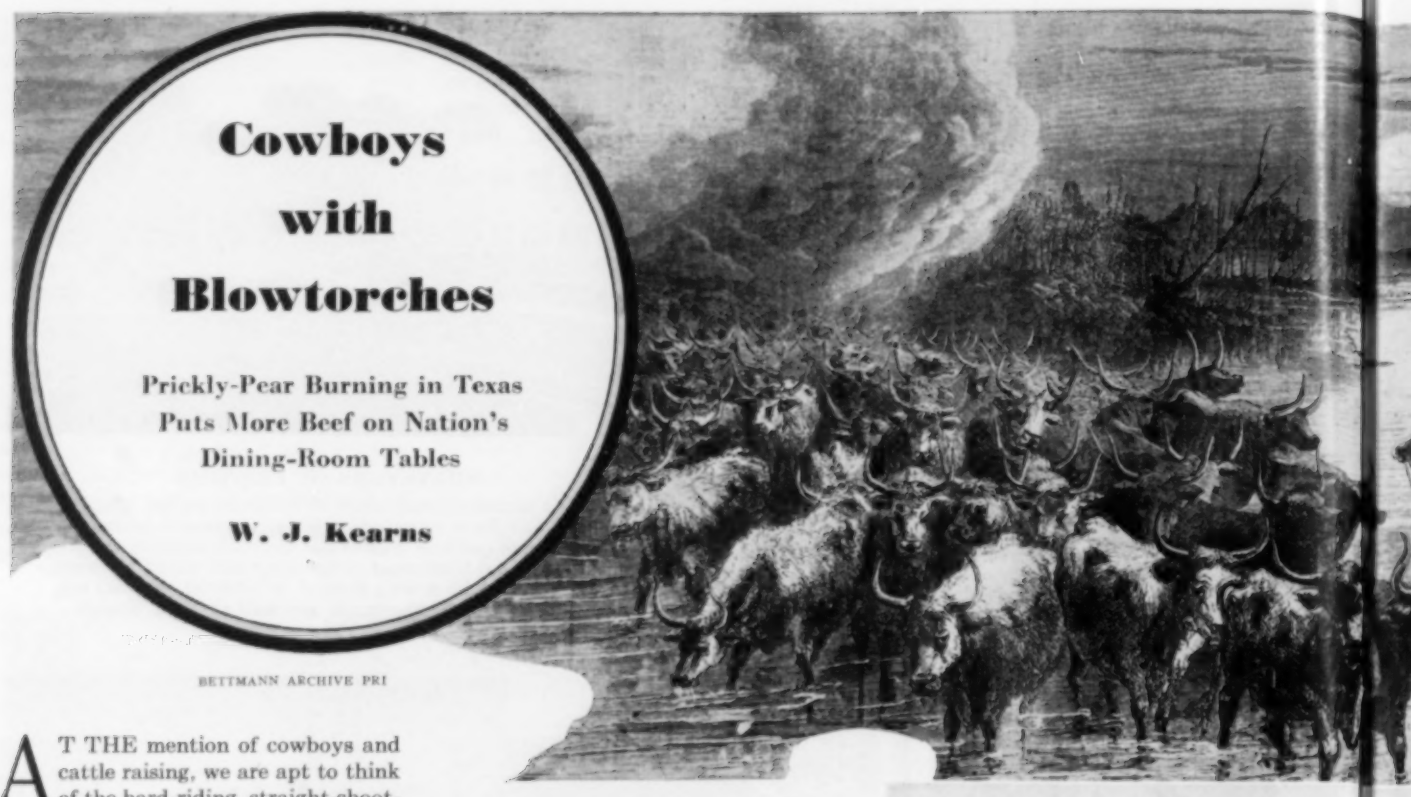
The success of Grasse is attributable to its wonderful climate, which is warm but not too dry and free from fog or frost. Fragrant crops are produced all the year round and keep the establishments busy. The most important of these is the orange blossom, of which 1100 tons were harvested in 1950. Next came jasmine, 720 tons; roses, 420 tons; mimosa, 58 tons; narcissus and daffodils, 40 tons; and tuberoses, 12 tons. The crop does not vary much from year to year and, to meet the needs of all the distilleries, is supplemented by imports from Italy, Egypt and North Africa. In 1950, these shipments amounted to $3,000,000.

In 1950 the essential oils and by-products of the Grasse distilleries had a total value of $17,000,000, of which 65 percent—about $11,000,000 worth—was exported to the British Commonwealth, the United States and South America. With the application of the latest process and equipment it is certain that these figures will mount considerably in the years to come.

Cowboys with Blowtorches

Prickly-Pear Burning in Texas Puts More Beef on Nation's Dining-Room Tables

W. J. Kearns



BETTMANN ARCHIVE PRI

ON THE WAY FROM TEXAS
A print from an 1867 publication showing Longhorn cattle being driven northward over the Chisholm Trail from Texas to railhead in Kansas. One doesn't have to be a stockman to notice a decided difference in appearance between these animals and beef cattle of today.

AT THE mention of cowboys and cattle raising, we are apt to think of the hard-riding, straight-shooting and sometimes silver-voiced hombre of the movies who somehow manages to spend most of his time chasing rustlers and winning the hand of the fair heroine. Seldom do we picture the stockman as the shrewd and intelligent businessman he is, and rarely do we realize that under his 10-gallon hat is a brain that has lifted the cattle-breeding industry into the realm of big business.

It is true that the stockman is still plagued occasionally by cattle thieves and that the modern cowpuncher dresses as colorfully as did his predecessor in the Old West. And, even though he sometimes uses a jeep to travel the range, he still relies for the most part on his faithful horse because fence riding and patrolling of the vast open spaces involve getting over terrain for which modern equipment is just not suited.

The cow horse is a specially selected animal, bred and trained for its job. At roundup time it has an uncanny foresight of the actions of the cattle when cutting a "dogie" out of the herd for branding, and the way a smart mount keeps the rope tight while the rider throws and ties a calf is a sight to behold. Were it not for the help the cowboy receives from his horse, his job would be much more difficult and dangerous than it is.

Like his horse, the cowboy's wearing apparel is extremely functional. For example, his broad-brimmed hat or sombrero is essential in the Southwest where the sun beats down unmercifully. The hat completely shades his face and protects it from the heat rays. His neckerchief shields him from the stifling and stinging sand that blows across the flat range country. His boots are especially designed for several purposes: the pointed toes make it easier for him to kick his feet into the stirrups, while the pointed, high heels not only prevent his feet from sliding through them—being caught in them—should his horse fall but also enable him to dig into the ground when attempting to bulldog, throw, a steer. Spurs are necessary to control his horse when he must use his hands for handling his lariat. His chaps protect his clothes and legs from sharp cactus and rough bushes through which he must sometimes ride.

In common with the progressive businessman of Main Street or the engineer in a large factory, the stockman's prime object is to increase the quality of his product and, like them, he has been successful in his efforts. Through extensive research in breeding and feeding he is able to supply the American family with more meat of a higher grade than that available to any other nation and still have enough left over to take care of less fortunate foreign countries. His success has not been the result of chance or luck but has been achieved through hard work and imagination, together with a desire to do a far better job than has ever been done before.

The cattle that ranged our great Southwest prior to the Civil War were of a hearty stock and able to take care of themselves so well that they required little assistance from man for their survival. The famous Texas Longhorn shifted for himself and multiplied in spite

BETTMANN ARCHIVE PRINT

FEEDING CORRAL IN KANSAS

Texas Longhorns were scraggly beasts at best, and after the long drive to Kansas they had need of a few good meals. To increase their weight and improve the quality of the meat before they were shipped to eastern markets, it became the practice to feed them in corrals, each steer consuming up to 75 bushels of corn. This created a demand for the grain, and vast fields were planted in Kansas. This picture was drawn by the noted artist Frederick Remington. "Such corrals," it was written at the time (1888), "are to be seen all over Kansas, especially near the railroad stations. Prairie hay is stacked there and there is water, and generally a windmill used for pumping. The animals, as Mr. Remington has drawn them, stand contentedly around their feeding troughs and the taming effects of a full stomach are quite visible."

"BURNING PEAR"

Three operators attacking a cluster of cactus on a Texas range with Blackwell burners. The spines on the prickly-pear variety shown here are harder to burn off than those of the cholla, a treelike cactus that is sometimes used as stock feed. Nevertheless, one man with a burner can cover up to 25 acres of prickly pear in a day.

of drought and intense heat. Therefore the cowboy's main job in those days was to round up the cattle each year and sort out those suitable for the market. Even that was a rather simple task because the market was confined mainly to their own area: there was no means by which the animals could be transported to the North and East, where the demand for beef was far greater.

All that was changed at the close of the conflict. When the North and East found themselves in urgent need of more meat than their own farms were able to supply, adventuresome men in the Southwest who had herds they could not dispose of locally endeavored to find a route over which they could drive the animals to one of the railroads leading eastward.

In this quest, cattlemen of the 1800's battled odds that would have caused men of lesser fortitude to give up in despair. They fought hostile Indians, swollen rivers that no one had ever attempted to cross, stampedes and inclement weather. And, after surmounting those obstacles and enduring the physical discomforts of twelve hours a day in the saddle for as long as two months at a time, they often reached their destination with half or less of the herds they had started with and with the surviving animals so emaciated that they brought poor prices.

But by dint of courage and persistence stockmen finally achieved their goal in 1867 when a Texan, named James Chisholm, established the first real trail between Texas and the western terminus of the railroad at Abilene, Kans. Over this Chisholm Trail thousands of cattle were driven on the first leg of their journey to eastern markets. Originally they were shipped immediately upon arrival, but that proved unsatisfactory because the long drive reduced the animals to little more than skin and bones. Consequently, it became the practice to fatten them on corn before they left Kansas. That was done by a "middleman" who raised neither cows nor corn but bought both.

EWING GALLOWAY PHOTO

CATTLE ON COLORADO RANGE TODAY

Here water and some, though not abundant, grass is available, but the area differs much from typical cactus land farther south. The animals are fat, and the clouds overhead, unless they are empties coming back from Iowa, may deliver themselves of precious moisture that will restore verdure to the brown-tinged vegetation.

Then a new problem arose. Having gained access to the country's great markets the cattlemen had to keep them supplied in order to retain them. To do that they had to raise an animal that would furnish more meat than the Longhorn. The answer was found in breeding and crossbreeding that sturdy creature with the comparatively frail stock of the eastern farms. But as time went on and railroads reaching into the Southwest eliminated the long drives to railhead it was no longer necessary to breed as hearty an animal as before and ranchmen strove more and more to produce heavier cattle that would provide top-grade meat.

With the increase in quantity and quality, the herds had to be given greater care—more protection. Instead of permitting the Longhorn to range the open spaces in search of food as formerly, it was now desirable to erect fences and to provide a great deal of fodder and water because the animals could not seek elsewhere when there was a scarcity on their own land.

One of the rancher's greatest difficulties is drought. The condition is as serious today as it was at the turn of the century, and in Texas and New Mexico it is not uncommon to have no rainfall for as long as nine months. Lakes and streams naturally dry up and grazing lands become parched. Under such conditions action has to be taken lest the cattle die of starvation.

Around 1880 it was discovered that certain varieties of cactus would provide cows with both food and water but that they were not edible until the sharp spines had been removed. To accomplish this, the plants were cut and hauled to a fire over which the thorns were burned off. Two species proved to be the best sources of fodder. One is the prickly pear that grows abundantly at low altitudes and the other a treelike kind that is sometimes referred to as deerhorn or elkhorn cactus and that is found in profusion at higher elevations.

The prickly pear flourishes on most of the ranges in Texas and New Mexico and is not affected by drought. It is highly nourishing and succulent and is particularly relished by livestock. However, the animals obviously can't get at it so long as it wears the armor with which Nature clothed it to protect it from its natural enemies, including every vegetarian from rabbits to cows. Not until cattle are tortured by hunger will they feed on cactus as it grows, because the spines sometimes puncture the intestines and cause death, or they stick in their mouths and cause infection. But once the thorns are removed, the animals eat the plants readily and thrive on them.

Around 1898 a practical portable spine-burning outfit was introduced to the western ranges. It consisted of a pressurized tank containing kerosene or other light oil that enabled a cowboy to bring fire to the cactus instead of the other way round. "Pear burning" then really came into its own. It is believed that Alex Snowden of Pearsall, Tex., was one of the first manufacturers of equipment of this type, and even today there are only three or four in the country. One of the largest is the Blackwell Burner Company of San Antonio, Tex. The Blackwell burner is made up of a tank that can be slung over the shoulder by a strap and of a long hose terminating in a pipe with a burner head.

The fuel reservoir is charged with air by means of a hand pump or by a compressor, and on the large ranges it is a common thing to see a small truck carrying a compressor following a group of cowboys so they can recharge their tanks from time to time. A popular unit for the service is the Ingersoll-Rand

Model SAFG, a single-cylinder machine driven by a gasoline engine. This compressor can take care of a large crew. A day's burning with one outfit will condition enough prickly-pear plants to feed from 100 to 125 cattle.

The Blackwell company reports that more than 50,000 of its burners are in service in the United States and many in foreign countries. By no means are all of them used for burning thorns off cacti, for the implements have other applications around farms. They are utilized extensively for eradicating weeds, grass and other unwanted growths along fence rows, highways and irrigation ditches; to disinfect seedbeds, chicken houses and stock pens; for drying sand; heating asphalt when repairing roofs; and, in cold weather, for thawing frozen pipes, tanks, hydrants, etc.

The dry season in the range country of Texas, New Mexico and Mexico usually extends from September to April and can be counted upon to occur nearly every year. One of the most serious droughts was experienced in 1935, and many a cowhand then got off his horse and took up a blowtorch. And with this magic implement in his hands he became a modern Pied Piper with the cattle hungrily at his heels. What happens under such conditions is graphically described in the following poem of anonymous authorship:

TANK-CHARGING COMPRESSOR

A small single-stage, gasoline engine-driven compressor such as the Ingersoll-Rand machine shown can be readily placed in the back of a pickup truck that can follow the cactus-burning crews almost anywhere on the range to recharge their tanks with air. Although a burner will work with 65 to 85 psi, a starting pressure of at least 100 psi is recommended by the manufacturer. The Blackwell tank is made of 18-gauge steel and tested at 300 psi pressure.

IT'S PEAR-BURNING TIME IN TEXAS

Hear the burner roar,
See the cattle running
Like a stamp of yore.
Everyone is straining
To be first on the spot,
The nearest to the burner
To get 'em while they're hot.
Eagerly they are scrambling,
For the feast is on
And there will be no slacking
Until the hunger's gone
And their sides are strutting
Like a toy balloon,
And the roaring burner
Stops its noisome tune.

A steer can hear a burner start up a long way off and will probably curl his tail over his back and make a dash in the direction of the noise because he has no intention of being the last to reach the fresh, smoking food. Once burning has been begun and cattle acquire a taste for prickly pear the process must be continued for otherwise the animals will attempt to eat the cactus, spines and all.

Cactus can be fed to milch cows as well as to range stock, but must, of course, be burned, cut and hauled to the farms. Dairymen have given their herds prickly pear for months at a time with practically no other roughage. The food is comparable to root crops or immature green fodder and is normally fed in a manner similar to silage. The high cost of feed is again bringing prickly-pear cactus into widespread use in the Southwest, and pear-burning is becoming a regular chore on most ranches. Through this development the burner has become standard replacement equipment for the cowboy's fabled six gun.

OTHER USES

The burners that shrivel cactus thorns also perform numerous other beneficial services for farmers, including weed eradication, killing insects and even melting snow and ice. The size most used weighs around 17 pounds. Kerosene is recommended as fuel, although other light petroleum distillates are suitable. Consumption ranges from 16 to 25 gallons per day.

To dispose of waste materials in its Detroit, Mich., plant, Burroughs Adding Machine Company devised the air-powered truck-loading equipment pictured at the right. Waste containers provided with wheels are pushed to a loading platform and thence onto an elevator where metal arms slip into sleeves on their sides. One end of a lifting cable that passes over an overhead pulley is attached to the piston of an air cylinder and the other end to a cradle holding the receptacle. When the latter reaches a certain height it is upended and dumps its contents into a waiting truck. On the return stroke of the piston the container is lowered to the floor. A device of this kind eliminates the need of an expensive loading platform or ramp and could be adapted for handling various kinds of materials.

PHOTO, COMPRESSED AIR & GAS INSTITUTE

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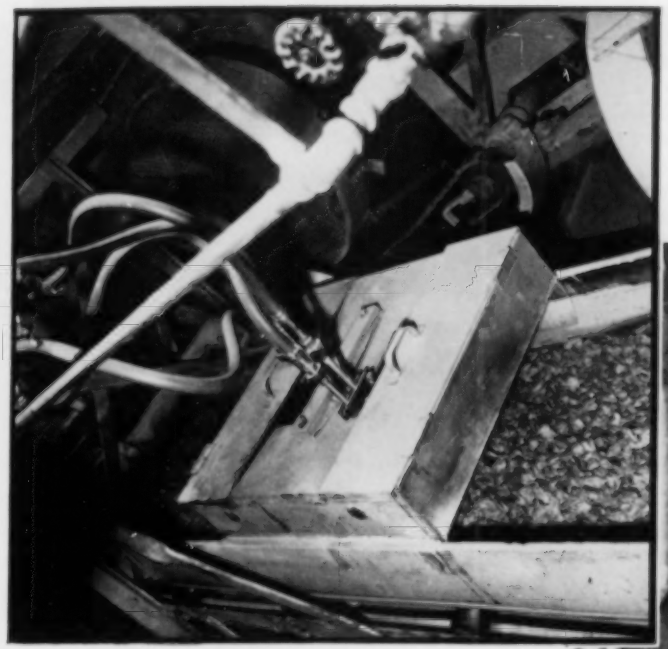
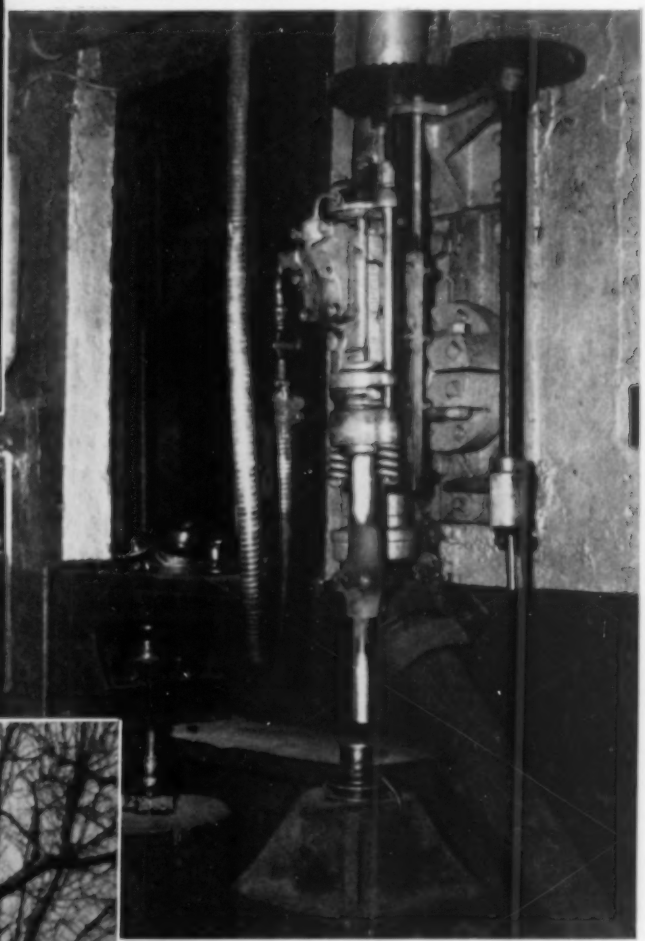
The apparatus shown on the tail gate of the truck below is making a compression test of soil borings at the site of a new housing project in Chicago, Ill. The test specimen is in the small cylinder above the operator's hand. It is compacted through the action of a piston in the hydraulic cylinder below his hand. This cylinder is supplied with fluid from a reservoir under 100 psi air pressure. The air is drawn from a tank that holds enough for about 50 tests. A load up to 350 psi can be applied by this model and is indicated on the dial at the top of the assembly. Complete stress-strain data are obtained by reading this dial and the one under it, which is a specimen strain dial. The equipment was developed by Soil Testing Services, Inc., 4520 W. North Avenue, Chicago 39, Ill., to determine the compressive and crushing strength of all sorts of small metal, ceramic, wood, and plastic parts, springs, soil, etc.



Shortly before Post Toasties cereal flakes are packaged in the General Foods Company plant at Battle Creek, Mich., they are enriched with a thiamin (vitamin B1) solution. Moving slowly on a canvas belt, the breakfast food travels under a 4-head spraying unit (left) that is connected by plastic hose lines with stainless-steel vessels in which the liquid is stored. It is pumped by compressed air that is regulated by recorder-controllers so as to feed the solution at a constant rate.

PHOTO FROM FOOD ENGINEERING

COMPRESSED AIR AT WORK



To closely control the composition of their products, steel mills periodically prepare samples for chemical analysis. The specimens are up to ¾ inch in diameter and must be pulverized. Crushing is accomplished by various means, but the one illustrated (above) predominates in the Pittsburgh area. It consists of an Ingersoll-Rand piston-type rock drill that is mounted on a frame over a mortar and can be cranked up and down to accommodate different mortar blocks and pestle attachments. After a sample has been placed in the vessel and the operator has opened the air valve of the machine the latter's rapid hammering speedily reduces the metal to the grain size desired by the laboratory.

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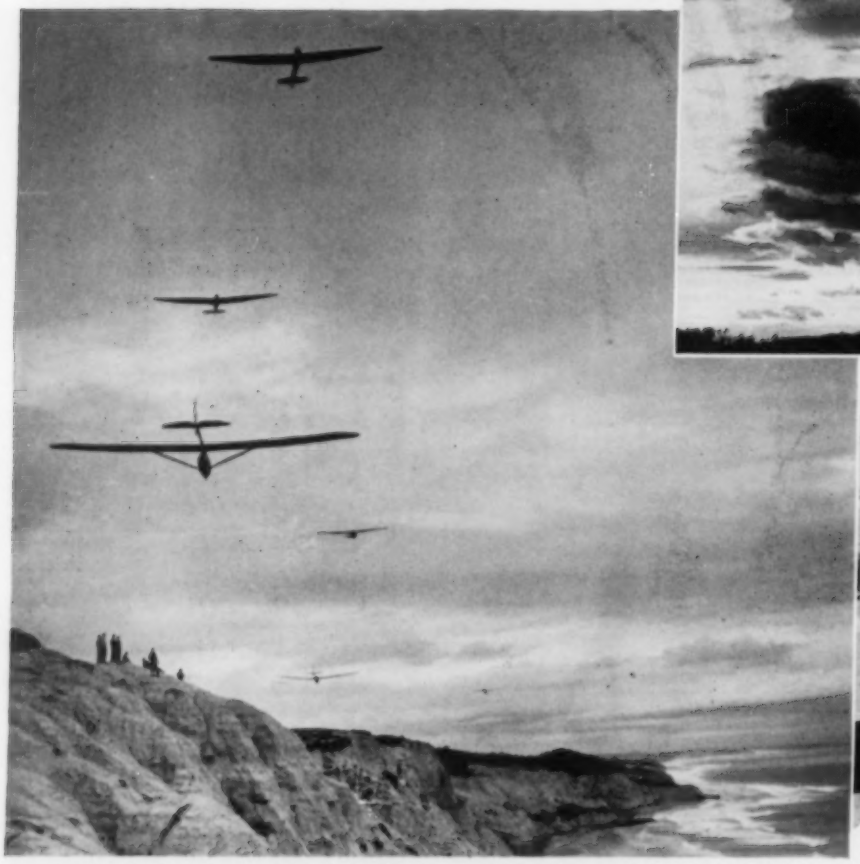
An enterprising Washington State orchardist mounted an Ingersoll-Rand air-cooled compressor on the back of a tractor and connected it to the vehicle's engine to obtain driving power. It delivers air at 100 psi pressure to a small receiver or tank under the unit. When photographed, it was supplying air to operate two tree pruners, and there was enough reserve capacity for a third one. The mobile machine also comes in handy for spraying insecticides and paint and for other jobs around the farm that require compressed air.

Gliding and Soaring

J. C. Pierce



PHOTOS, SOARING MAGAZINE

PLAYING TAG

The cliffs at Torrey Pines near La Jolla, Calif., send aloft incoming ocean breezes which, along with thermals—warm updrafts—from a wide expanse of sun-soaked beaches, create excellent low-level soaring conditions. The group of sailplane enthusiasts shown above are competing in a championship meet. A good flier learns to read cloud formations like the average man reads a bulletin board. A cumulus cloud indicates a much desired thermal, unless it has a feathery edge which means that it is beginning to dissolve and to create downdrafts. If it turns into a thunderstorm it can be a record-breaking but hazardous soaring medium. Frontal thunderstorms bring in cold air that sends up warm air to form long chains of cumulus clouds fine for pilots who know how to keep their craft from being sucked into the thunderheads. Shown at the top-right is such a turbulent wave condition under which William S. Ivans, Jr., rose to a height of 42,100 feet near Bishop, Calif., on Dec. 20, 1950.

SOON after man learned to think, he probably reasoned that it was indeed unfortunate that the power to fly should be granted birds and denied him. Egyptian statuary and stories in Greek mythology plainly indicate the challenge offered, for records of its stimulus on man are found all through the ages. How many gave their lives in attempts to imitate the birds will never be known, but accounts of fatal leaps from towers into the wind on makeshift wings go back to ancient Rome.

Leonardo da Vinci (1452-1519) is credited with having been the pioneer in the art of flying, although his scientific and engineering accomplishments are usually subordinated to his outstanding work as painter, composer, poet, botanist and anatomist. He left detailed records of exhaustive studies relating to the theoretical and mechanical aspects of flying, which placed him fully 350 years ahead of his time. He had neither the materials nor the manufacturing techniques at his disposal to put to use his basic knowledge

of aerodynamics and his conceptions of the parachute and helicopter.

By the turn of the last century scientists had finally caught up with da Vinci in the field of aeronautics. LeBrix of France, Cayley, Henson, Stringfellow and Pilcher of England, and Montgomery of America are among those who contributed to the over-all advance in the art of aviation in the latter half of the nineteenth century. More notable was Lilienthal of Germany who made a successful gliding flight in 1891 and followed it with about 2000 glides through which he learned the advantages of curved over flat wing surfaces. He shifted his weight to maintain the balance of his craft, and Chanute, seeking to gain better control in 1896, discovered that movable surfaces on the ship's wings and tail assemblies would not only help to maintain balance but also contribute to maneuverability. The Wright brothers took this cue and introduced the elevator and flexure planes on the rear edge of wings. Then they added a petrol engine to a glider in 1903 and launched propelled flight. However, Langley preceded them in this respect with his steam-engine equipped *Aerodrome* with which he flew a distance of half a mile in 1896.

Though much was learned about aerodynamics through gliders between the Lilienthal experiments and the Wright's motored plane, only a start had been made. Before powered aircraft could be expected to serve man in any practical manner much more had to be known about the forces affecting them in motion; the laws that regulate the flow of air about their surfaces; the conditions governing balance control and safety; the design in relation to the weight to be supported; and control mechanisms. Many of the answers were found through use of the glider as the principal vehicle for experimentation.

But the early enthusiasts were not satisfied with their progress. The simple glide and the motor-assisted flight were not enough. They still had not acquired the skill or discovered the secret of the large feathered creatures that can soar hours on end without the flap of a wing. To imitate the eagle, the albatross and even the lowly buzzard was the ambition of those with the relentless urge to fly. They would persist in their efforts until they too could soar with only the natural air currents and their skill to keep space between their craft and the earth. Seven years after the Wright brothers successfully took aloft their motor-powered glider, Orville made the first sustained motorless flight, soaring for ten minutes. His glider became a sailplane.

In strictly academic aeronautical language, gliding is a generic term for all forms of motorless flight. However, it has become the practice to differentiate between gliding and soaring. Hence, the popular definitions follow these lines: gliding is the art of flying a motorless plane in a steady downward course or glide; soaring, an advanced form of gliding, makes use of the wind, thermals—warm air updrafts—and other energy of the atmosphere to prolong flight and even to gain altitude, to rise above the starting point. In other words, the glider is generally a simple craft, whereas the soaring plane, or sailplane, is the streamlined result of precise aerodynamic design.

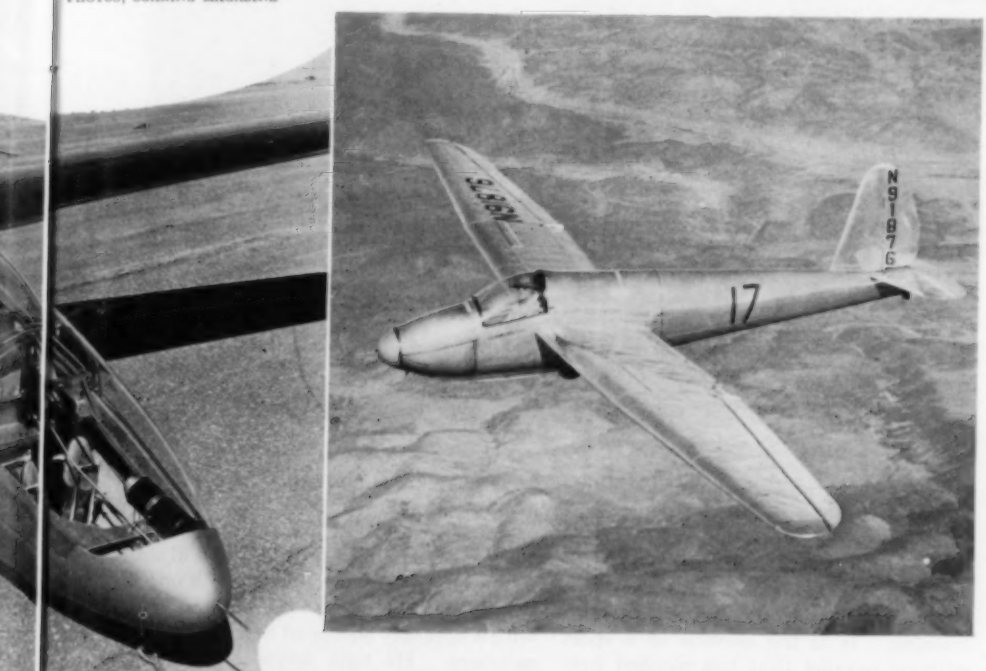
The day of the basic glider is past. It played an important part in aeronautical development up to about 1930, at which time it became largely outmoded. It could do no more than sail rather steeply to a landing from a higher launching point, and hence its usefulness was limited to studying only the most fundamental principles of flight. Its gliding ratio was in the order of 3 to 1, meaning it could advance 3 feet for every 1-foot loss in altitude.

Today there are essentially three classes of motorless planes with but a fine line of distinction between them. The utility glider is intended primarily for training purposes and has a gliding ratio of about 10 to 1. It can withstand rough ground handling and is sometimes "souped up" to perform in the lower fringes of the sailplane class. The World War II military training glider has entered the civilian motorless-flying picture as a sailplane with a gliding ratio of between 20 and 22 to 1. Increased knowledge and application of the latest aerodynamic and structural data and materials have given us the high-performance sailplane, which is exceedingly maneuverable and has a gliding ratio upwards

HIGH UP AND AGROUND

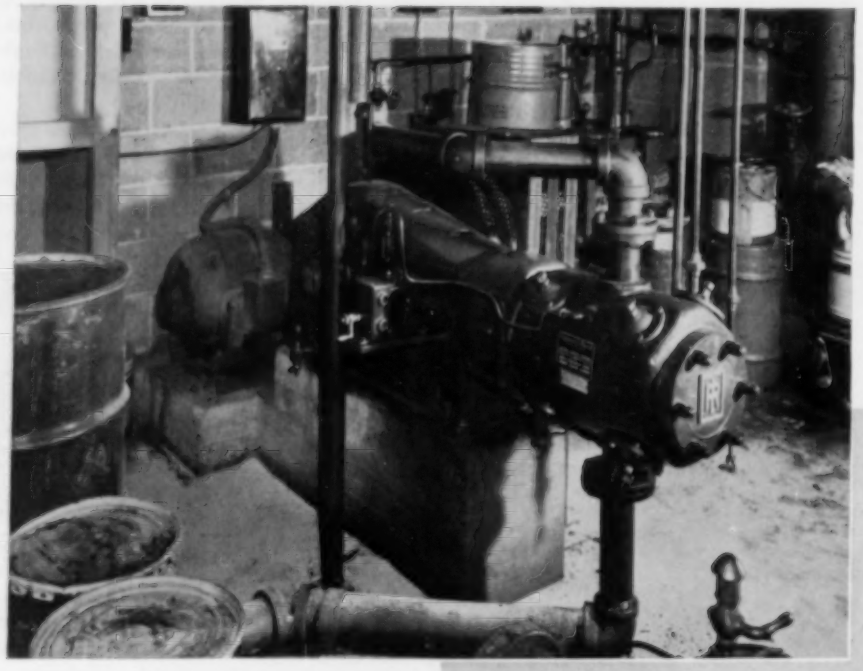
Shown below is an all-metal Schweizer 1-23, America's most modern sailplane, which holds the world's altitude record for ships of this type. At least three of these planes, slightly modified, are now in Spain to compete in the International Soaring Championship. The dropable gas tank carried by military aircraft serves as a base for the fuselage of a new glider (center) designed by Irving Prue of California. There is no room in it for baggage, but ample space to give the pilot free movement with his parachute on.

PHOTOS, SOARING MAGAZINE



ANCHORED BIRDS

The structural differences between the high-performance and the utility sailplane are brought out in this picture. The latter type, in the background, is a 2-seater and is extensively used for training students. These ships belong to the Schweizer Glider School.



PEACETIME TO WAR WORK

Shown here is the plant of Schweizer Aircraft Corporation, Elmira, N. Y., America's only manufacturer of gliders and seaplanes since World War II. Now, because of the Korean conflict, its facilities are being used to make parts and accessory equipment for military aircraft. It is well equipped for the work with pneumatic drills, grinders, riveters, screw drivers and other tools which are supplied with air by a Type ES-1 compressor (left) with a capacity of 100 cfm.

of 30 to 1. Some of these motorless craft have enclosed cockpits, oxygen systems, standard-airplane controls and flight instruments. For sailplane pilots who have the urge to build their own ships there is the Baby Bowlus. It is provided in kit form and, when properly assembled, meets the requirements of the Civil Aeronautics Authority.

Orville Wright's memorable soaring flight in 1910 marked a big step forward in aeronautics. That accomplishment provided engineers and scientists with data which, added to the facts obtained through the basic glider, were invaluable in unraveling the complexities of air dynamics. Together, those motorless planes were used for progressive pilot training, and the sailplane still serves that purpose. At least one of the world's airline companies stipulates that its aviators undergo periodic soaring training, claiming that it makes them more conscious of true flying—of the inherent forces of nature and the fundamentals of aerodynamics which are prerequisites to good piloting. In the case of the Civil Aeronautics Authority, half of the training hours that are required to obtain a powered-plane license may be gliding hours.

Each time man decides to increase the speed of aircraft he encounters a new set of variables that he must overcome. High-velocity wind tunnels are now indispensable in designing airplanes, but the motorless craft has not lost its usefulness in this field. It has become a laboratory tool that can be subjected to actual conditions encountered in flight without the influences of motor vibration and propeller wash. It has proved to be a valuable means of testing instruments and in gaining certain aeronautical and meteorological information unobtainable by power-driven ships. Each class of powerless plane—utility glider, or ordinary or high-performance sailplane—has its own place in this branch of research.

But the sailplane does more than further aerodynamic knowledge and pilot training. It is the nucleus of a sport without parallel that has reached considerable proportions in many lands. What could be more thrilling and contribute more to one's self-reliance than to sail in the sky with the birds, silently and without effort? Gliding has an allure and offers a challenge not easily resisted by men and women of all ages and walks of life. Thousands belong to glider clubs or schools and are members of the Soaring Society of America, Inc., The Soaring Association of Canada or similar organizations in other countries.

Although there are a number of methods of getting gliders and sailplanes aloft, the airplane tow is now by far the most popular because the craft can be released when conditions are most favorable to flight. It is also effected by auto tow, consisting of a rope or cable approximately 500 feet long, and by a powered winch which winds up the tow rope at a high rate of speed. In any case, launching is usually done from a high point of land into favorable air currents.

As in all sports, there is competition in soaring. This year attempts will undoubtedly be made to beat William S. Ivans, Jr.'s altitude record made in 1950 with a specially equipped Schweizer 1-23 sailplane. He took advantage of the great mass of ascending air known as the Bishop (California) Wave and climbed 42,100 feet above sea level. There will be many tries to better Paul MacCready's out-and-return goal flight. At a Texas meet he soared to a predetermined point and returned nonstop to his launching site with 229 miles to his credit.

And there are those preparing to dethrone young Richard Johnson who put 575 flight miles and 545 map miles between his starting point in Odessa, Tex., and his landing place in Salina, Kans. Johnson's account of this flight is a thrilling adventure story of man pitted against the elements in an effort to stay aloft and better the coveted "500" mark. His use of every warm-air updraft, every favorable air current and every trick in sailplaning proved that he has the skill and stamina required of champions in this field of sport.

VIEWED FROM ALOFT
Convention Hall is 488 feet long and 288 feet wide and its vaulted roof would clear a 13-story building. In front of it runs the famed Atlantic City boardwalk that flanks the beach.

King-Size Town Hall

Atlantic City's Meeting Place Will Seat as Many People as the Yankee Stadium

C. H. Vivian

ASIDE from the ocean, the biggest thing in Atlantic City, N. J., is Convention Hall. Although the building was put up 23 years ago, it still bulks larger than anything of its kind in the world. Its main auditorium has accommodated as many as 35,000 persons and could seat 41,000 if need arose. With all its other rooms in use, the structure would hold 70,000, which is more than the permanent population of the resort city. Anyone who likes statistics can have a field day perusing the figures on this huge meeting place.

Convention Hall is everything that New York's Madison Square Garden is and more. Actually, the "Garden" could be set down in the main auditorium of the Atlantic City structure and there would still be enough space left to circle it with a running track and seat a lot of people around the edges. In this room is the world's most expansive stage and a pipe organ which, from the standpoint of number of pipes (33,000 ranging from 3/16 inch to 64 feet long) is the largest in existence. It can be played from either of two consoles, one stationary and the other movable. The former is reputedly the only console ever built with seven manuals. Four years and $500,000 went into the creation of the instrument, which contains enough wire to girdle the globe twice. In addition to the auditorium there are 24 rooms that can be used for meetings. Chief among them is the ballroom, in which up to 5000 people can sit down together at a banquet. It has its own pipe organ, a $50,000 job that would be considered huge in most places.

As the name implies, the principal function of the building is to house conventions, but even so it gets only the big ones that go to Atlantic City. The smaller assemblies can be accommodated in one or more of the numerous hotels that have extensive facilities of their own for such purposes. The hotels and enclosed piers formerly took care of all the different meetings, but about 25 years ago it became evident that more room under one roof was needed to house some of the larger gatherings, especially those that involved displays of goods and equipment.

To finance its $15,000,000 cost (it would be much higher today), Convention Hall bonds, guaranteed by the city, were sold. They were later refunded and became a part of the regular city debt. The hall is thus a creature of the municipal government. While the aim is to break even or perhaps make a little profit on its operation, its chief role is to attract conventions because conventions bring people, and people spend money for rooms, food, recreation and even whoopee. Without its super-duper hall the resort city wouldn't get the real big meetings and shows.

Into the building went ten million bricks, 12,000 tons of steel and 42,000 cubic yards of concrete that embodies 65,000 barrels of cement. The outstanding structural feature is the absence of columns in the main auditorium, the roof of which is supported by giant sliding trusses that span the full width of 288 feet. Because of their great length it was necessary to make provision at the points where they join the walls that would enable them to shorten or lengthen as much as 3 inches with variations in temperature.

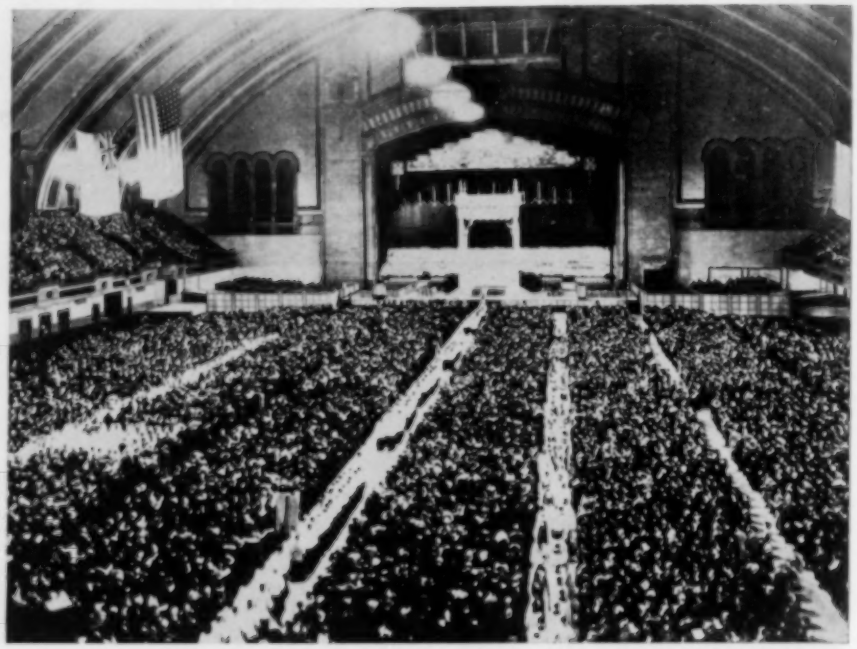
In the course of a year the hall's interior changes appearance oftener than a chameleon changes color. Attractions run the gamut from flower shows to hockey games and from religious meetings to bathing-beauty contests. During every twelvemonth more than 1000 gatherings are held, with the total attendance exceeding 1,500,000, or 25 times the city's stable population. The average is around three meetings a day each numbering 1400 persons. As many as eight conventions have been staged in four weeks.

Needless to say, such a varied schedule calls for quick and sometimes startling changes in "props." In winter,

hockey and basketball games are played on regular dates. Interspersed as they are with displays of different kinds some fast switches often have to be made. Furthermore, regular maintenance work must be carried on to take care of wear and tear. To handle all this the hall has a permanent staff of 75 employees headed by P.E.M. Thompson who has been connected with it since it was built. At times the list swells in a few hours to 350 or more, including carpenters, electricians, plumbers, riggers, laborers and what not. During 1951 more than 1800 names appeared on the $500,000 payroll. Most of the conventions accompanied by large exhibits of merchandise or machinery are held in the fall, winter, and spring. In summer the hall is the home of the Ice Capades.

The auditorium's most eye-filling spectacle of the year is the annual Beauty Pageant at which Miss America is chosen. Almost every kind of competitive sport has been seen in the commodious enclosure. Partly to emphasize the mammoth proportions of the hall and partly in an effort to inaugurate a regular popular feature, a football game was arranged for October 25, 1930, between teams representing Lafayette and Washington and Jefferson colleges, both leading contenders for national honors that year. Clay-bearing soil suitable for use as a playing base was not obtainable in Atlantic City, so, to make it an all-Pennsylvania affair, 50 carloads of dirt was shipped in from nearby Hershey. It was spread 11 inches thick, then compacted to 7 inches. After the gridiron had been laid out there was still room for 14,000 seats.

Mr. Thompson recalls that the boys were a bit skeptical about the adequacy of the space. They were afraid, he explained, that when they kicked the ball it would hit some of the overhead lights. But, he added with a chuckle, it didn't hit anything. The arched ceiling is 137 feet above the floor, or about the height of a 13-story structure. Incidentally, the longest home run on record in a baseball game wouldn't carry the 488-foot length of the main hall.



BIGGEST CROWD

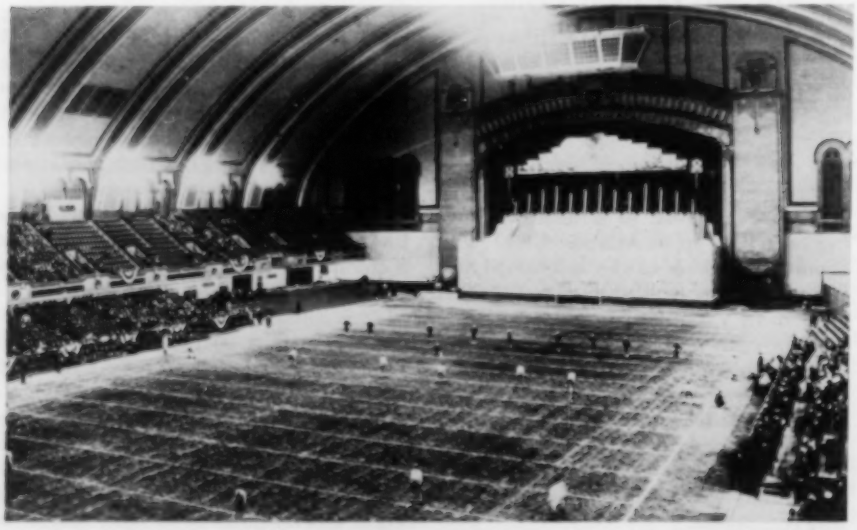
During a triennial convention of the Episcopal Church, this throng of 37,000 persons attended one of the conclaves. Officials of the hall say 4000 more could have been accommodated. Forty thousand seats have been set up for a boxing bout.

Football games were played each year until 1942, when the Army Air Force took over the building for the duration of the war. It had been customary to pile the gridiron dirt, which also came in handy for horse shows, in the basement when it was not needed. But during the Army occupancy the soil was moved to the airport and stored outside. Most of it soon blew away, so there has been no football in the auditorium since the war ended primarily, however, because of the many conventions scheduled.

The main hall has 140,000 square feet of floor space, but even that isn't enough to set up all the exhibits at some trade shows. On such occasions stairways are opened to the floor below, and as much of that level as necessary is utilized. Among the conventions which have called for that maneuver are those of the packaging, housewares, bottling and auto-parts industries. The lower floor is normally used as a parking place for automobiles, which are driven in from the street on one side and out on the other. There is room for 500 cars.

Special provisions have been made for getting machinery and other heavy or large display equipment in and out of the building. Railroad spurs run along the two sides, and when the structure was new most shipments arrived by rail. In recent years, however, more have been delivered by truck. To accommodate them, platforms have been added, and there are ramps that enable carriers to drive in before unloading.

With an eye to the future, the planners of Convention Hall wisely made arrangements whereby it would be possible to supply all the utilities exhibitors might need to operate the machines and apparatus on display. Flush with the smooth concrete floor and distributed



INDOOR FOOTBALL

Football games were played in the spacious enclosure each season until the Army took over the hall during the late war and "lost" the dirt that was kept on hand to make a gridiron. Seats for 14,000 can be set up after a regulation playing field is laid out.

MACHINERY EXHIBIT

The Foundrymen's "show" of last May (below) ranked high as regards weight and size of machinery though other trade expositions have called for more room. A display of pneumatic equipment is pictured at the left. Seventy-two exhibitors' spaces were connected to the hall's compressed-air lines at this show so that machines and apparatus could be seen in operation.

throughout the area are 105 metal covers which, when lifted, reveal boxes containing outlets for the following service lines: compressed air, up to 1 inch in diameter; gas, 3 inches; cold water, 2 inches; hot water, 1 inch; steam, 1¼ inches; steam-condensate return, 1¼ inches; and drain, 4 inches. Besides these there are 400 emergency boxes that can be tapped. Removal of one of these 8-inch lids exposes valves on trunk lines that run beneath the floor and deliver the various utilities.

To furnish compressed air, the basement harbors a machine with a capacity of 180 cfm. This unit generally suffices, but there are occasions when the management has to give it an assistant in the form of a rented compressor. One of the biggest consumers of air power on record was the show of the American Foundrymen's Society, which made its initial appearance in the hall last May. Seventy-two exhibitors used compressed air, and 21 outlets were in service on the stage alone. Two extra machines, a 75-hp and a 50-hp unit, brought the total available capacity to 700 cfm.

Still another utility—brine—is brought into play when the 100x200-foot hockey rink is prepared for use. There are forty-five 2½-inch outlets for this service, and the brine is cooled to a subfreezing temperature by two compressors rated at 250 and 100 tons of refrigeration. During the hockey season games are held twice weekly. At other times, when the space is not required for other purposes, the ice is left in place and the rink is open to the public for skating.

Like most other things that attract visitors to Atlantic City, Convention Hall fronts on the boardwalk, which commands enough interest in its own right to warrant a brief description. The promenade grew from a walk that was built in 1870 after a hotel proprietor named Jacob Keim had complained to city authorities that the leveling of sand dunes in front of his establishment had permitted the ocean to advance so far at high tide that his guests couldn't stroll on the beach. He and Alexander Boardman, a railroad conductor who apparently liked to walk, petitioned to have a sidewalk laid, and the council responded by appropriating the then huge sum of $5000 to construct a "tide-proof" walkway. That first promenade was a mile long, 8 feet wide and only 12 inches above the sand.

In those days Atlantic City was just a seaside village reached from Camden by an unpleasant railroad ride behind a wood-burning locomotive. When summer ended, visitors quit coming and the sidewalk was taken apart and stored for the winter in a barn that was rented for $17 a season. Gradually the resort gained in popularity and real estate became more valuable. Owners of beach-front property soon began to extend their holdings by constructing jetties that promoted the deposition of sand on the seaward side. As this practice continued, the walk was moved farther out each year. Eventually the city council became tired of chasing the beach in this manner and made it illegal to develop real estate seaward of the walkway.

The original boardwalk lasted until 1879, when another one was built. It and its successor were both destroyed by storms in 1883 and 1889. The fourth structure, which formed the nucleus of the present one, was dedicated on May 10, 1890. Part of it was wrecked by a hurricane on September 14, 1944, and has only recently been put back in shape in its entirety owing to the difficulty of getting lumber. The promenade now extends for a distance of 6 miles and is used by fifteen million persons yearly. Bicycling on it is permitted each morning between seven and nine.

Those who do not wish to exert themselves or cannot because of some physical impairment may ride over the boards in rubber-tired rolling chairs pushed by colored attendants. They were introduced 70 years ago by Harry D. Shill, a partial cripple, who imported the first reed-upholstered vehicle from the English seaside resort of Brighton. Afterward he formed a company that still rents the chairs to the public. More than 4000, open and closed and of varying sizes, are available, and approximately one million persons hire them annually.

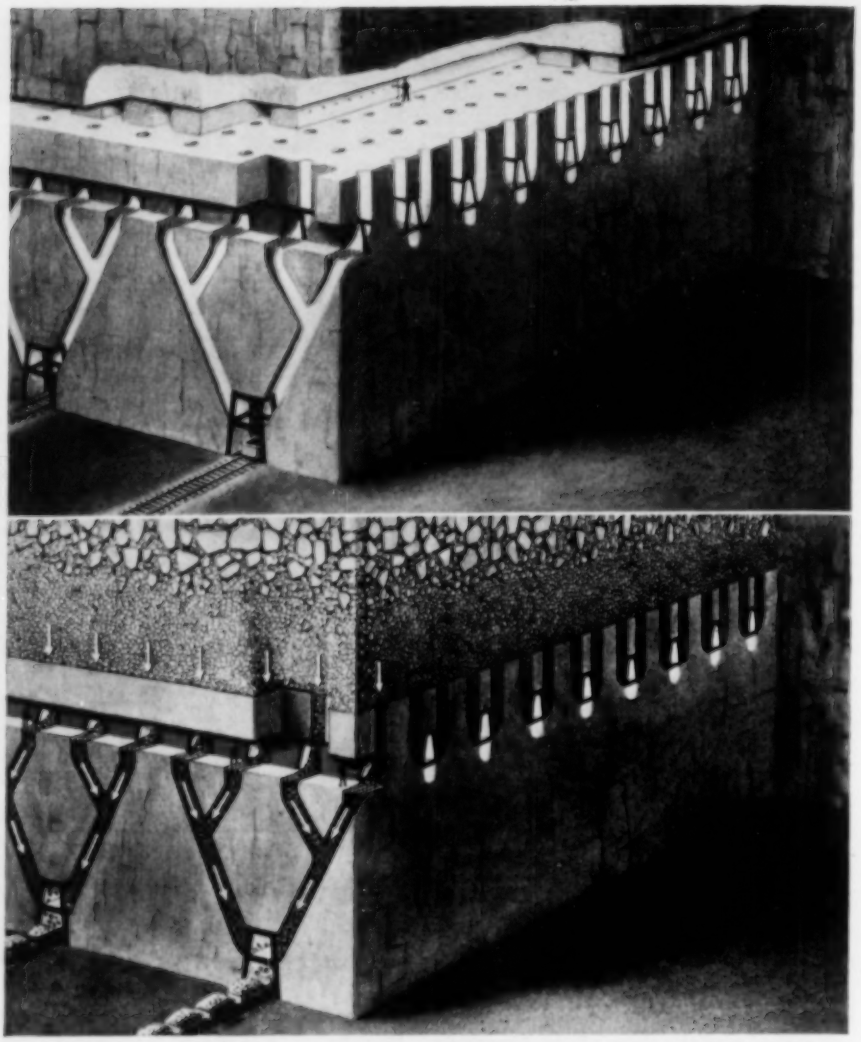
Carpenters are kept busy the year round replacing boards in the walk, and the maintenance cost runs to $100,000 a year. The boards are spaced about ¼ inch apart, and dirt and crumpled papers that lodge in the cracks are removed periodically with blasts of compressed air applied by means of long-handled jets.

Anaconda Looks Ahead

Huge Expansion Program Includes Ventures in Aluminum and Uranium

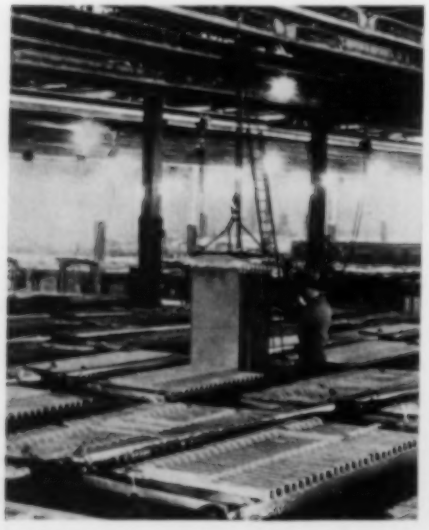
ANACONDA Copper Mining Company is engaged in a program of expansion, rehabilitation and improvement that entails outlays of $289 million. Of this sum, $142 million has been disbursed since 1946, leaving $147 million still to be spent. Sixty-six percent of the total, or $191 million, is being expended on facilities for mining and processing copper ores. Supplementing these outlays for increasing the company's traditional line of business are others for mining or processing zinc, manganese, aluminum and uranium ores. The latter two metals are not presently being produced by the company.

By far the largest sum, $111 million, has been allocated for the expansion of operations at Chuquicamata, Chile, where a subsidiary firm, Chile Exploration Company, is working the largest-known copper ore body. From the beginning of activities in 1915 to December 31, 1951, there was extracted from this open-pit mine 502,844,000 tons of material, of which 350,796,000 tons was copper-oxide ore and the remainder waste.



BLOCK CAVING EXPLAINED

In the underground section (top), Y-shaped transfer chutes have been driven from the haulage level to the control or grizzly level. From the latter, in turn, U-shaped chutes have been driven to the undercut level where a man is represented drilling into one of the ribs that have been left to support the overlying ore and that occupy spaces between horizontal channels. The lower picture shows what happens when these ribs or pillars are blasted. The ore overhead caves, crumbles and falls through the grates or grizzlies into mine cars on the haulage level.



ZINC REFINERY

Tank house of the electrolytic zinc plant at Anaconda, Mont. A similar plant is located at Great Falls, Mont.

There remains to be removed from the pit as it is now developed some 260 million tons of ore, of which 140 million is of the sulphide type. To treat it, a new plant has been under construction since 1948. It will include crushers, a concentrator, a smelter and also a water-supply system consisting of a dam on the Arroyo Salado River and 45 miles of 30-inch pipe to carry 40,000 tons of water daily for metallurgical purposes. A 12-mile standard-gauge railroad has been laid to connect the works with the Antofagasta-Bolivia line. Living quarters already provided for employees include 544 homes, 12 dormitories for single men, and 44 staff houses.

In 1951 the original plan was modified to increase the sulphide-ore concentrator from seven to ten units, to build new crushing facilities and to add to the ore bins and smelter. These changes raised the estimated cost from $90 million to $111 million. Two units of the plant began operating in May. When all are in service, which is scheduled for 1953, the combined output of the new works and the existing oxide plant will exceed 500 million pounds of copper per year.

To increase the copper-producing capacity at Butte, Mont., the $27 million so-called Greater Butte Project is taking form. It will provide means for mining low-grade ore that was left in place during the extraction of richer grades in years past. Utilizing an inexpensive block-caving system of mining, there will be recovered from above the 3400-foot level more than 130 million tons of ore containing 20 pounds of copper and small amounts of gold and silver per ton.

Ore is already being hoisted from the 600-foot level through the record-size Kelley Shaft with a cross section of 38x9 feet, and additional haulageways are being established on the 1300- and 2000-foot levels. The newly developed ore, which is expected eventually to yield 90 million tons of copper annually, will supplement the normal output from higher-grade areas and has made it necessary to expand the ore-treating facilities at Anaconda, Mont. It is expected that the Greater Butte Project will prolong production from what has been termed the "richest hill on earth" for several decades.

Another copper-mining activity on the program calls for opening up a mine at Yerington, Nev., 80 miles southeast of Reno, where Anaconda acquired and explored an ore deposit in the 1940's. The Yerington property is known to contain about 35 million tons of copper-oxide ore of an average grade of 0.97 percent. Underneath it is at least 15 million tons of copper-sulphide ore, which is not being considered in the present plans.

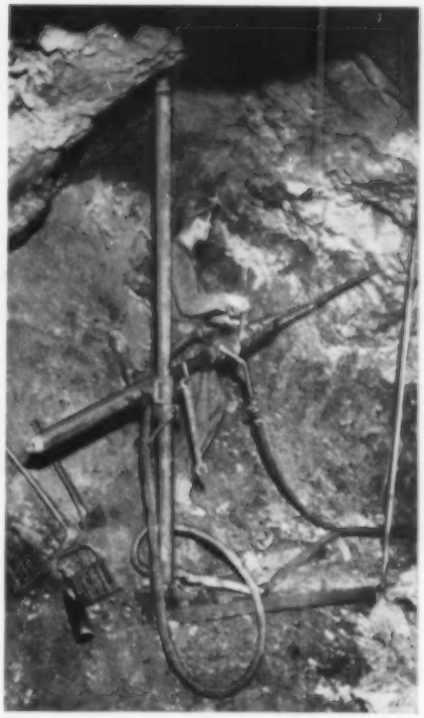
The site will be prepared for open-pit mining by stripping the overburden. Leaching and precipitation plants will be built and equipped and a townsite and housing constructed. Copper will be precipitated on scrap iron, and the precipitate will be shipped to Anaconda's Montana mills for smelting and refining. Production of copper is expected to begin in 1953 and to reach 66 million pounds a year within two years. The cost of the undertaking is placed at $38 million.

During World War II, Anaconda's subsidiary, Cananea Consolidated Copper Company, S. A., worked a copper property at Cananea in the State of Sonora, Mexico, and built new ore-treating and power-generating facilities with $18,184,600 that was advanced by the Reconstruction Finance Corporation. The agreement was terminated in 1947, with Anaconda taking over operations in return for continued cash payments based on production and prices up to December, 1954. These payments are expected to aggregate $10 million. Output of copper up to the beginning of 1952 totaled 289 million pounds.

Anaconda's venture into aluminum production depends upon the successful conclusion of current negotiations. The company proposes to acquire a 95-percent interest in the Harvey Machine Company, Inc., of Montana, which has been seeking authority from the Government to construct and operate an aluminum reduction plant in Flathead County, Montana, that would utilize power from the Hungry Horse hydroelectric development. If these plans go through, Anaconda will spend approximately $45 million on a plant that will have an annual capacity of 54,000 tons by 1954.

Anaconda is the largest domestic producer of manganese ore, all of which comes from Butte and is processed at Anaconda. The ore is of low grade as mined, but is converted into a high-grade concentrate which, when roasted, yields a high-grade manganese nodule from which ferromanganese is made for the steel industry. The electric furnaces used for the final step of this treatment were modernized in 1946 and four new ones were put in service in 1949.

To increase its output of zinc in the Butte District, which amounted to 130 million pounds in 1951, Anaconda is spending $8 million. It is also preparing a custom mill in New Mexico at an expenditure of $4 million to process uranium ores for various producers.



BASIC MINING TOOL

A fundamental tool in all metal mining is the air-powered rock drill, one of which is shown here working under the surface of Butte's famous hill. It is an Ingersoll-Rand reverse-feed stoper mounted on a pneumatic column. A lot of blast holes will be required to bring down the 130 million tons of low-grade copper ore that is scheduled for recovery by block caving.

In addition to the foregoing undertakings, Anaconda is investing $5½ million in copper-refining and casting facilities and $27½ million in improving operating conditions in its brass mills, which are run by a subsidiary, The American Brass Company. These mills are located at six points in the Midwest and East and one in Canada. Together with three specialty plants in Connecticut, they employ 13,000 persons and their products are marketed through 26 sales offices.

Other items in the program include the enlargement of facilities for producing phosphorus compounds and sulphuric acid to strengthen the company's position in the fertilizer industry in the western states, installing new equipment for cutting and handling trees and processing them into timber for the Montana mines, and improving the railroad that hauls ore from Butte to the reduction works at Anaconda. In line with a movement to better conditions in the communities where it operates, the company has provided some employee-club facilities at Butte and Great Falls, Mont., and erected the Butte Memorial Hospital at a cost of $4,158,000.

PRODUCING FERROMANGANESE

For the past four years Anaconda has supplied more than 90 percent of the manganese produced in America. The ore is mined at Butte, Mont., and initially processed at nearby Anaconda in the electric furnaces shown.

Automatic Machine Tests Oil-Well Pipe Under High Pressure

OIL-WELL tubing and casing that may be subjected to increasingly high pressures in the course of production can be tested at pressures up to 10,000 psi by new hydrostatic equipment recently installed at the Ambridge, Pa., plant of the Spang-Chalfant Division of The National Supply Company.

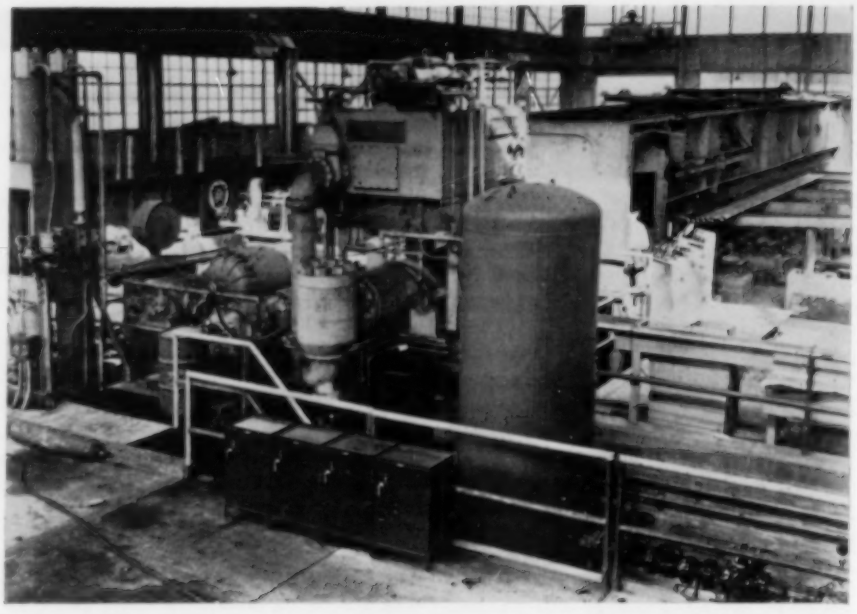
The new test bench, built by Hydropress, Inc., is 86 feet long. The foundation for it and its accessories contains 360 cubic yards of concrete, is 112 feet long and 42 feet wide at one end, and has water sumps 13½ feet deep. To protect the operator and other workers in the area, the tester is enclosed in a metal housing with elevating doors on both the inlet and outlet sides. Interlocking of controls permits applying pressure to the pipe only when the doors are closed and loading and unloading only when the doors are open.

There is a test head at each end of the machine and both can be moved forward or backward to accommodate pipe sections of differing lengths. The head at the filling end of the pipe is actuated by double-acting hydraulic cylinders that move it swiftly at first and then slow it down just before contact is made. Its travel is sufficient to allow for a variation in pipe length of 7 feet, while that of the test head at the opposite end provides for a greater variation in length. The latter is on a motor-driven adjustable carriage held in position by heavy air-operated locking pins that fit in holes in the side frames.

In entering the bench from the operator's side, the pipe being tested rolls against adjustable stops that are lifted to permit it to roll into V-blocks on six prespaced clamping carriages which ride on side frames consisting of two 5-inch-thick steel slabs 6 feet high and 81 feet long. The clamps on the carriage near the end farthest from the operator close first, and air cylinders actuate linkage to pull the pipe into the test head at that end, where a switch is tripped to shut the other carriage clamps and the doors. The pipe is positioned on the skids by a gauge that assures its clearing the test head at the far end when entering the bench.

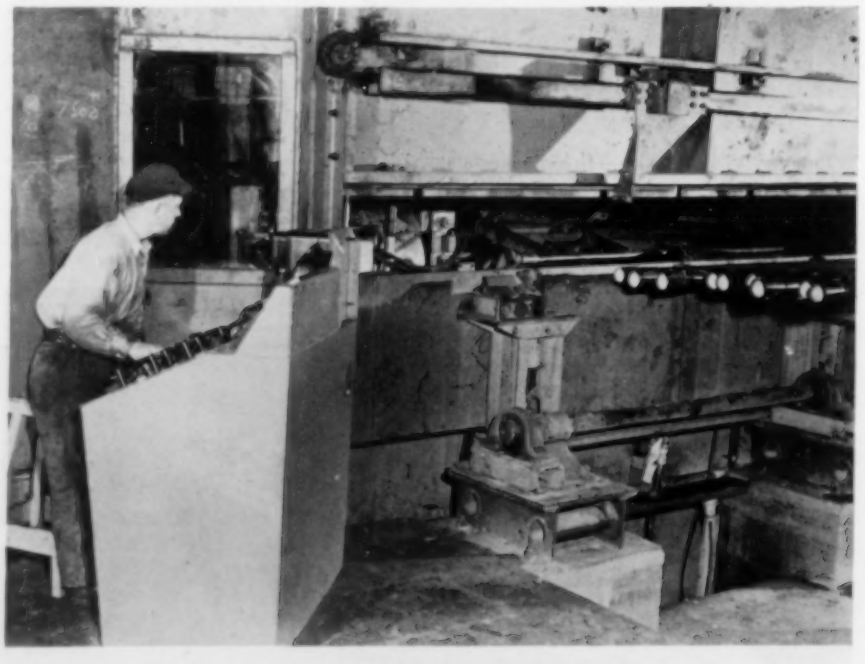
The pipe is filled with water from a 710-gallon tank that is under 100 psi air pressure. Then a filling timer closes the valve and high-pressure water is admitted from intensifiers, the water pressure also serving to tighten the sealing rings. Pressure is generally held five seconds before valves are opened, the main ram is returned, all clamps are released except the one that opens after withdrawal of the pipe from the far head, the doors open, the pipe drains, and kick-out arms on each carriage remove it from the bench.

The different phases of the test follow successively after a button is pressed, but each operation can be controlled individually. When holding the pressure for the normal period of five seconds tests may be run at the rate of 120 an hour.



OVER-ALL VIEW

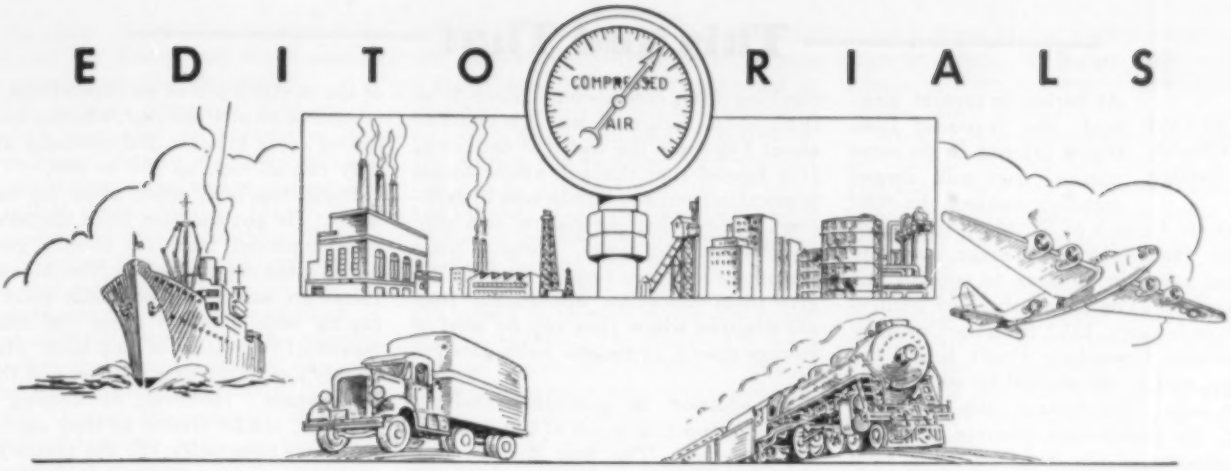
The operator and his console are barely visible at the right-center, and pipes awaiting test are just beyond them. The large vertical tank contains water which is under 100 psi air pressure to quickly fill each pipe. At the extreme left are intensifiers in which pistons moving up and down build up pressures to 10,000 psi, maximum, for testing the pipe. The horizontal cylinder at the near end of the testing enclosure is on a line with the pipe section inside and provides it with an oil-hydraulic back-up force. It is filled with oil from the rectangular tank above it at the same time the cylinders on each side advance the test-head assembly and bring it in contact with the near end of the pipe. The assembly is carried on a crosshead mounted on the ram of the central cylinder.



OPERATOR'S STATION

A door at the level of the man's head has been elevated and a length of pipe has rolled in to begin the test cycle. Upon its completion, the pipe will be kicked out on the opposite side. At the press of a button the machine operates automatically.

EDITORIALS



HELP FOR GOLD MINERS

IF THE fortunes of the gold miner continue to ebb, he may take the place of the rodent in the old saying, "As poor as a church mouse." Gold-mining is no longer a Cinderella industry. Everybody covets gold but nobody envies its producer. Inflation has given the Midas touch to everything but the metal that has perennially stood for wealth. The gold miner is caught in an inflexible vise. Costs continue to mount, while the Government resolutely refuses to increase the price it pays for the metal and will not permit the industry to seek a higher figure in world markets.

For that matter, the world's "open" markets pay little more than Uncle Sam, mainly because there isn't much that can be done with gold other than hoard it. An individual can't set up a mint and start turning out double eagles, and coinage has been the principal use of the yellow metal through the ages whenever governments have been on the gold standard.

Perhaps the reason for the gold miner's sorry plight is attributable to the fact that he hasn't done and isn't doing anything to make his product wanted — to create additional applications for it. Instead of sitting around and waiting for the Washington solons to pay him more, maybe he would do better to foster a research program and thus discover new ways of putting gold to work. At least, that is the thought advanced by A. G. Campbell, writing in Canada's *The Monetary Times*.

Mr. Campbell recalls that nickel was once a liability instead of an asset. It was considered a contaminant in the copper The International Nickel Company sent to its customers. Eventually it was learned that steel plate containing nickel was the best obtainable armor for ships. During World War I various military uses were found for nickel, and there was a sizable boom. When peace came nobody wanted the metal, and in 1921-22 the company suspended all production. In the latter year Robert C. Stanley became president and launched a research program that ferreted out so many applications for nickel that by 1929 more was being used for nonmilitary purposes than had ever gone into munitions.

In a similar manner the demand for aluminum has been increased greatly, and silver, which once had only a few more applications than gold has today, has been put to work in many industries. Meanwhile, no organized effort has been made to determine how many things gold is good for. Gold mining is sick and getting sicker. Perhaps it's time to call in a new doctor. The industry still has enough money to finance a modest research program. Because any worth-while fruits would benefit all gold producers, it shouldn't be difficult to obtain international participation in such a scheme. If an undertaking of this sort were successful, gold would take its place among commodities and command a price in accordance with consumption. Many branches of endeavor have become prosperous by creating a demand for their products. Certainly, gold miners should at least give it a try.

•

SIGNIFICANT ANNIVERSARY

ON JULY eighteen, in Delaware, E. I. du Pont de Nemours will observe the 150th anniversary of its founding. On a bank of Brandywine Creek, near the granite walls of the small powder plant that gave the firm life, company personnel and guests will gather. Across the stream, on high ground, stands the du Pont research center, the largest facility of its kind. A few miles away, in Wilmington, are the firm's main offices. However, to get a comprehensive look at the mammoth du Pont organization you would have to do a lot of traveling. It has 71 widely scattered manufacturing plants with 87,000 employees. With materials it buys from 30,000 suppliers it makes 1200 lines of products that are sold through 75,000 outlets to Mr. and Mrs. America and a lot of people in foreign lands. In the beginning, one man owned the concern; now it is a corporation with 138,000 stockholders.

During its first 100 years du Pont was mainly a processor of black powder; in the last half century it has become the world's leading producer of chemicals. Around World War I days it introduced the enamel Duco, which soon became a leading material for coating automobiles. The automotive industry was not firmly established then, but du Pont believed in its future and made its most profitable outside investment in 1917: a 22 percent interest in General Motors Corporation. In 1920 du Pont entered the rayon field. Then came cellophane, Lucite and other plastics and, more recently, Nylon, Orlon, and Dacron. All these and many others were developed at a cost of millions of dollars.

An instinct for research was instilled in du Pont at the start, for its founder, Eleuthere Irenee du Pont, worked in the laboratory of the great French scientist Lavoisier before coming to this country. The company's history shows that every dollar spent on research eventually leads to the expenditure of $3 for new plant and equipment. At present the firm's assets total 2.1 billion dollars.

The progress achieved by du Pont is convincing testimony of the value of research. Two hundred years ago a British economist made the dolorous prediction that in order to feed and clothe the world's growing population it would one day be necessary to put children down to four years old to work. He knew nothing, of course, of the miracles of technology that lay ahead; of the ideas for doing things faster that were to come from the brains of men then unborn. At the time of the prediction, workmen carried their own tools and were in fact the only people that had any. Nowadays, large companies provide the tools. In a chemical business such as du Pont's, plant and equipment come high. Including working capital, the concern has an investment of $17,600 for each employee.

This and That

To Curb Church Sinking

At Astley, in central England, the National Coal Board intends to do some mining that will almost certainly subject the 600-year-old Church of St. Mary to subsidence. So, to obviate damage, steps are being taken in advance to support the structure. The board obtained permission in January, 1951, from the Coventry Diocesan Consistory Court to do the work, and it was started by contractors last June. The scheme calls for "floating" the church on a concrete raft. Underpinning of the main walls has been completed, and the bulk of the weight of the tower is now being transferred to a 40-foot-long reinforced-concrete beam. Forty tons of steel and 700 tons of concrete are being used to carry out the $140,000 project.

* * *

Ford Uses Electronic Chemist

The composition of metals entering into machinery can be checked by measuring invisible light rays with the aid of an electronic instrument. At the Ford Motor Company, this new exacting science, known as spectrochemistry, analyzes molten foundry metal—scrap metal that goes into cupolas and into parts furnished by suppliers.

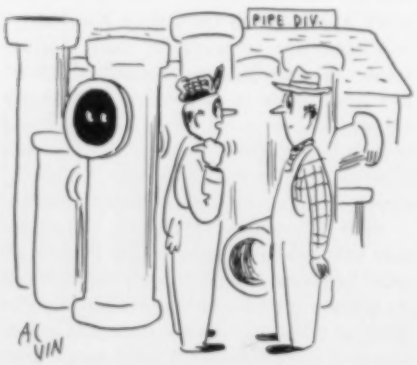
Two tiny pieces of the metal to be checked are placed in the instrument, and a 25,000-volt spark is discharged between them. This sets the metal a-blaze, and each ingredient such as silicon, manganese, chrome, nickel, etc., emits its own invisible ultraviolet light. The optical system of the device sorts the characteristic wave lengths of the several elements. These are picked up by photo-electric tubes that measure the intensity of each one and record the amount present on a clock-like dial. Molten metal from foundry cupolas can be analyzed almost instantly and corrections made in the melt before pouring if its ingredients have not been correctly proportioned. The new instrument is replacing a method that uses photographic plates to give the desired information.

* * *

Nation Takes Cover

Sweden has 15,000 bomb shelters which, collectively, can accommodate a million persons and is adding 2000 more annually. All are underground spaces blasted in the granite and gneiss mantle that covers most of the country. They are finished with reinforced-concrete arched roofs to prevent rocks from falling should they be jarred loose by pressure waves resulting from concussions. Each is as thick as the rock roof, which is equal to about 1½ times the width of the room. It is figured that this will afford ample protection from any bombs now in existence. Every chamber has its own supply of water and power. Many of them are, in reality, deep tunnels in rock. To give them peacetime application they are situated where they can be used as storage spaces, gymnastic halls, garages, etc.

In addition to providing shelters, Sweden is putting much of her industry underground. The first subterranean factory was built ten years ago, and since then numerous other plants, hospitals, hangers, military headquarters, munitions and fuel dumps have been similarly located. Service in the civilian defense organization is mandatory for all Swedish citizens between the ages of 16 and 65, and 900,000, constituting one eighth of the population, are now undergoing training.



"Keep busy, I think the efficiency expert is around again."

Geese Gobble Weeds

Because cotton growers must produce the staple at a figure that will enable it to compete with the new synthetic fibers, they are paying close attention to crop-tending costs. This economy move has introduced geese as weeders in Missouri, but the birds are not yet being used extensively. Missouri cotton planters are divided in their opinions as to whether it is cheaper to remove weeds and grass by geese or by chemicals. They are agreed, though, that the old-fashioned hoe, which can be bought for about $3, is the most expensive tool that can be placed in a cotton field.

Jim Bogle has 1100 geese grazing on an 800-acre cotton farm that he manages near East Prairie, Mo. They attack grass and a good many of the weeds. They won't eat cockleburs, smartweed, lamb's quarters and some other growths and apparently leave cotton plants alone. On an average, they do three-quarters of the weeding job at an expenditure of around $6 an acre per year, whereas hand hoeing costs at least $20 annually and may run as high as $55 or $60.

Bogle has been using geese for four years. He got the idea from his father who employed them for twenty years on irrigated cotton land in New Mexico. Geese are said to be especially good at coping with Johnson grass and other perennial vegetation of this kind. Hoes merely lop off the tops of these and they grow again. However, by keeping at the new, tender shoots as they appear, the geese eventually kill the plants because the roots can get no nourishment from above ground.

Geese have to be put on a diet if they are to work effectively. Unless they are fed some corn, they get sluggish and won't rustle for a living. On the other hand, if they are given too much corn, they just hunt a shady spot and refuse to work. The expense of maintaining geese includes losses to dogs and foxes and the cost of fencing areas that would otherwise not be enclosed.

* * *

Trapping Small Particles

In their studies of microscopic particles in the atmosphere, technologists of Stanford Research Institute are using artificial spider webbing and high-speed air jets. Their objective is to trap the minute specks to gain a better understanding of elusive air-borne bits of mist and dust. Beautiful sunsets, blue skies and other visual aspects of the atmosphere are attributed to the presence of finely divided materials, just as overhead murkiness is caused by smoke particles. These substances, when present in certain sizes, reflect or divert certain colors and let others pass so that a cloud of them appears to be blue or red or some other hue that usually has no relation to the color of the particles themselves. Some are known to cause disease and others may do so. It is only the smallest ones, however, that get into the human respiratory tract, for we are equipped with nasal filtering systems that catch the larger ones.

In setting out to develop means for snaring these natural and man-made particles, Stanford workers realized that the motes must be brought in contact with something. This is not easy to do because all exposed surfaces are surrounded by a "bumper" of still air that light specks do not readily penetrate. Illustrative of this is the fact that only a few flakes of light snow will actually strike the windshield of an automobile moving through a storm, the others are pushed aside by the air bumper in front

of the glass. However, when sleet falls, the bits are heavy and dense enough to get through the air blanket.

The particles referred to here are minuscule compared to snowflakes and have great difficulty in passing through the air bumper guarding the objects used to collect them. Paul L. Magill, technical director of the air research project, reasoned that he could reduce the size and resistance of the air blanket by reducing the size of the medium in front of which it forms. He also planned to speed up the movement of the particles so much that they would literally be shot through the protective envelope of air and collide with the collecting surface with sufficient force to adhere to it.

Years ago, Dessens, a French scientist, decided that the best fine-particle collector could be made by stretching the sheerest spider-web filaments across a small wire frame. He succeeded in guiding some tiny spiders back and forth on such a frame, spinning as they went. By waving the resulting grid through the air, he gathered droplets of water and crystals of salt that were not visible without a microscope and the existence of which he had not realized.

To obtain his fine filaments, Mr. Magill turned to modern synthetics rather than to spiders. He dissolved a resin such as Lucite or Plexiglas in aniline to form a material with the consistency of honey. A drop of this was placed between two rubber stoppers and smeared over their surfaces by rubbing them together. By drawing the stoppers apart a distance of about 2 inches he succeeded in making as many tenuous fibers as several dozen racing spiders could produce in a day. By laying these over a frame, he fashioned a grid for sampling smoke, dust, or mist.

When it is not convenient to collect particles in this manner, they may be propelled onto a plate by means of a high-speed jet. This apparatus is made by arranging a series of nozzles of diminishing size, one following another. Air is then drawn through the smallest orifice with a vacuum pump. By reducing the pressure on the suction side to about one-half the atmospheric pressure, the air and the particles it carries attain a speed close to that of a .22-caliber bullet at the muzzle of a rifle. When the particles strike a glass plate placed in their path, some of them adhere and can be observed under a microscope or otherwise studied.

Automatic Air-Conditioning System for Aircraft

MARTIN'S new 404 airliner has a completely automatic air-conditioning system, the components of which are shown in the accompanying cutaway picture. The nucleus of the system, which is a development of AiResearch Manufacturing Company, is a single-stage cabin compressor mounted on the right main engine. A "slipping-clutch" arrangement and 2-speed drive mechanism (a Borg-Warner Fordomatic automatic transmission provided the elements for the latter) take care of overload and idling power conditions in flight and on the ground, thus permitting continuous output of compressed air. The latter is ducted through the plane to a secondary compressor powered by a cooling turbine, and thence through a secondary heat exchanger, aftercooler, and water separators. Between the time the air leaves the cabin compressor and reaches the separators it has dropped from 200° to 64°F and reaches the cabin at a temperature ranging from 72° to 82°. The system can also be used for heating by either by-passing the cooling mechanism and using the natural heat of compression or piping the air through the aircraft's heating system.

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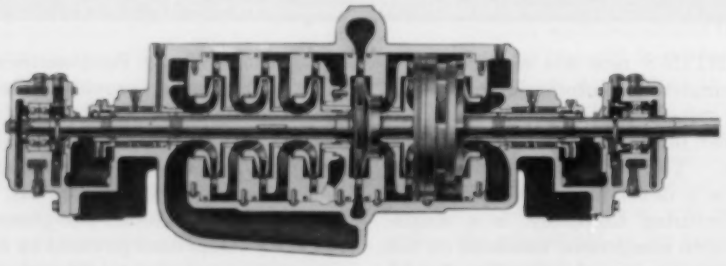
Industrial Notes

For marking extra-hard surfaces as well as delicate parts that will not withstand heavy pressure, Jas. H. Matthews & Company has designed a fully pneumatic machine that takes flat, contoured and round work, both hollow and solid. The die is held in a reciprocating slide actuated by a horizontal pneumatic cylinder controlled by a switch, and the worktable brings the part to be marked in contact with the die. The equipment is automatic in its action and is operated by a foot-controlled air valve. To elevate the table, the worker depresses the valve, and within a timed interval the slide starts to move back and forth, deepening the mark with each pass. The machine can be set for single-stroke operation by changing the cylinder switch from the reciprocating to the standard position. During the working period the table is kept under a constant air cushion adjustable up to 6000 psi on a minimum air-line pressure of 100 psi. Rounded parts are held in a cradle roll and gauges are used for flat pieces.

To its line of fire extinguishers, Walter Kidde & Company, Inc., has added a pressurized portable model that applies a dry chemical. It has a capacity of 5 pounds and can be reserviced by filling the powder chamber and charging it with compressed air or other gas at 150 psi, which is the operating pressure. Any drop in pressure is indicated on a gauge and can be built up by aid of a shop air line or other means. The unit is 15 inches long and controlled by a trigger.

Alcuplate is the name of a new material being produced by the General Plate Division of Metals and Controls Corporation in sheet and tube form. The base metal is aluminum with a copper overlay not less than 0.0015 inch

Ingersoll-Rand Company has announced a redesigned line of horizontal, multistage centrifugal pumps for medium-pressure application that are said to be more efficient and to give better service than the earlier models. The units, known as Class CNTA, are intended for boiler-feed, mine-dewatering, marine, refinery and general industrial use at pressures up to 800 psi. They feature a horizontally split, smooth-bore cylindrical casing containing a unit-type rotor assembly consisting of the shaft, impellers and channel rings with multiple-volute fluid passages. The entire assembly is easily installed in the casing because no mating ring fits or delicate alignment problems are involved. According to the manufacturer, the multiple-volute design eliminates radial thrust under all operating conditions and thus insures a balanced rotor, while the back-to-back grouping of the impellers neutralizes axial thrust developed by the pressure differential across each stage. The CNTA line has the same interstage sealing system that has proved so satisfactory in Ingersoll-Rand's higher-pressure Class HMTA pumps. It consists of a cast iron-alloy or stainless-steel piston ring placed around the outer circumference of each channel ring. When the casing halves are bolted together, the hydraulic-type step-seal rings have a metal to metal fit and are automatically put under the correct compression by the casing. Ball bearings, ring-oiled from their own reservoirs, are standard, but sleeve bearings are available; stuffing boxes may be packed solid or for injection or circulation, as best suits the application; and a Cameron shaft seal may be used where the liquid to be handled presents difficulties. Sizes range from 1½ to 3 inches, and 4-, 6-, and 8-stage units are available.



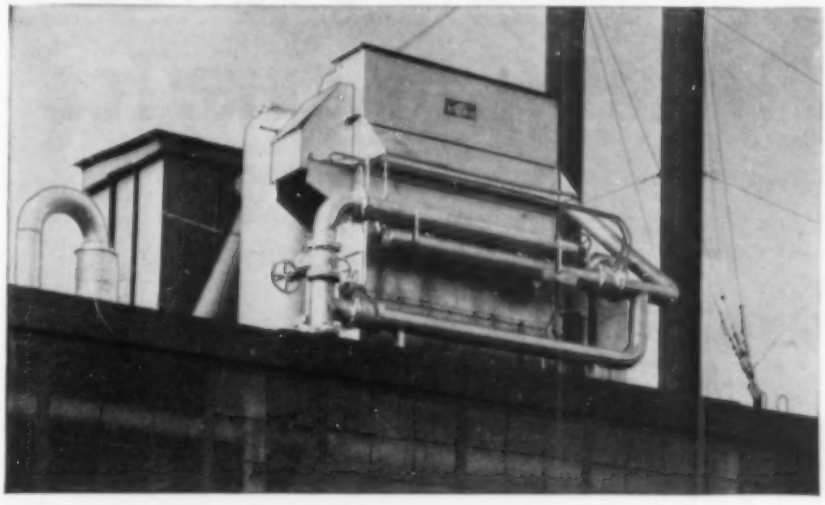
thick on one or both sides. The bond, says the manufacturer, is as strong as the aluminum. The composite material is available in sheets up to 6 inches wide and ⅛ inch thick (other sizes made to order), and in single- and double-clad seamless tubes up to one inch in outside diameter. Alcuplate wire is now in the experimental stage.

Bucyrus-Erie Company has announced a new 6-cubic-yard excavator which embodies features found heretofore only in its large stripping shovels and draglines. The machine, designated as the Model 150-B, has a lower boom section with widespread feet that eliminate the need of sway braces. It is rigidly connected to the A-frame and thus an integral part of the excavator. The upper boom section is pin-connected to the lower one and suspended from the A-frame by fixed-length bridge strands. The dipper handle is tubular and free to rotate in a cylindrical saddle block containing rubber cushions to absorb shock loads during plugging of the swing. Doubled hoist

ropes are attached with an equalizing sheave to each side of the dipper. The crowd machinery is located at the forward end of the revolving frame instead of on the boom to minimize swing inertia. According to the manufacturer, the twin hoist automatically applies hoisting pressure where needed to cut through obstructions in a bank, and the dipper moves upward steadily in its digging stroke. The shovel can be converted into a dragline with the drag and hoist operated by independent electric motors. It is designed and built for long service and maximum output with a minimum of maintenance.

Keeping hose lines both handy and out of the way often presents a problem, especially in shops where many are in service. Zierden Company claims to have solved the difficulty of interfering hose with a reel that pays out only as much as is needed by a pull on the line or rewinds it by an upward push safely

Direct saving of cooling water expense returns to you the cost of a Niagara Aero After Cooler in less than two years.



How to Get Drier Compressed Air:

It prevents many troubles and saves much expense

● NIAGARA AERO AFTER COOLER cools compressed air or gas below the temperature of the surrounding atmosphere. Therefore you get no further condensation in your lines. You save much in repairs to pneumatic tools and equipment; you save much interruption to production; you save water damage in paint spraying, in air cleaning, in any process where compressed air comes in contact with your materials or parts in manufacturing (sand blasting, for example).

Niagara Aero After Cooler uses evaporative cooling, saving 95% of your cooling water consumption. This saving quickly returns the cost of the equipment to the owner or makes extra cooling water available for other processes.

The Niagara Aero After Cooler produces compressed air with 30% to 50% less moisture than by ordinary cooling methods. Other Niagara equipment provides bone-dry air for processes requiring it.

If you have an air problem or a cooling problem, a Niagara engineer probably has an answer that will improve your process or save you operating or maintenance expense.

Write for Bulletin 98

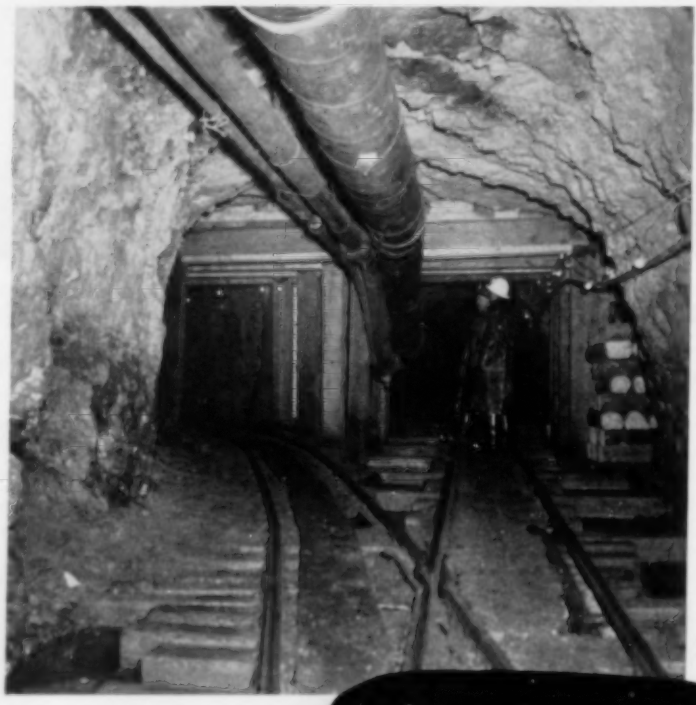
NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. CA, 405 Lexington Ave. **New York 17, N. Y.**

Experienced District Engineers in all Principal Cities of U. S. and Canada

Familiar Scenes
IN MINING SERVICE



Ventilating Lines by NAYLOR

You see Naylor Pipe widely used in push-pull ventilating service because its exclusive structure gives it so many more performance advantages. Light weight makes it easier to handle and install. The Lockseam Spiralweld creates a reinforcing truss, assuring additional collapse strength and permitting use of lighter gauge material without sacrifice of performance. The larger the pipe diameter, the more this is true. Combined with the Naylor Wedge-Lock coupling, Naylor Pipe gives you a tight line that hugs the wall and can be coupled quickly with only one side of the pipe in the open. Re-use and high salvage value are also important features. It will pay you to get the complete story.

Write for Bulletins 507 and 514

Naylor Pipe Company
1245 E. 92nd St., Chicago 19, Ill.
New York Office:
350 Madison Ave., New York 17, N.Y.

out of reach. It can be mounted overhead, as shown, on a wall or ceiling convenient to a pipe outlet, or under a workbench where blow-off air is used or where pneumatic or hydraulic tests are made. Other mountings include through-the-

wall or through-the-floor types, in which case the hose is passed through openings to the points of application. The reel is made of heavy-gauge wire, and the spindle through which air, water or steam flows into the line is a precision-machined casting provided with stainless-steel ball bearings for smooth and easy rotation.

For use in plants where sparks from static electricity are a safety hazard, Walter G. Legge Company has produced a shoe that is on sale under the name of Conductive Bootie. It is made of cotton with a conductive sole and is held on by a metal plate spring-fastened to a buckled elastic garter. Besides being cheaper than conventional leather safety shoes, the bootie is easy to clean and takes up little storage space.

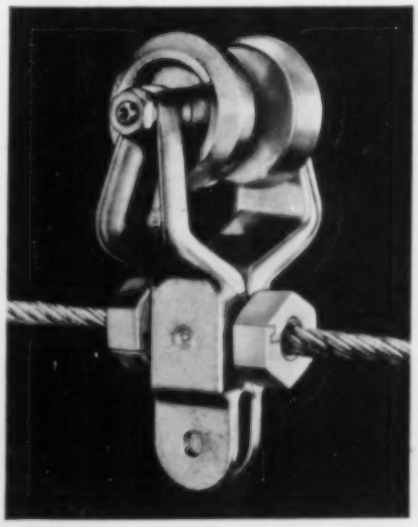
For light machinery driven through V-belts there is now available a line of sheaves molded to close tolerances of Campolene, a new fibrous material that is said to insure a hard-wearing surface unaffected by oil, moisture and temperature changes. Designated as W-C Sheaves, they are made with or without keyways by W. C. Products, Inc., in sizes from 2 to 6 inches, outside diameter, and bores of ½, ⅝ and ¾ inch. They are supplied with Allen setscrews.

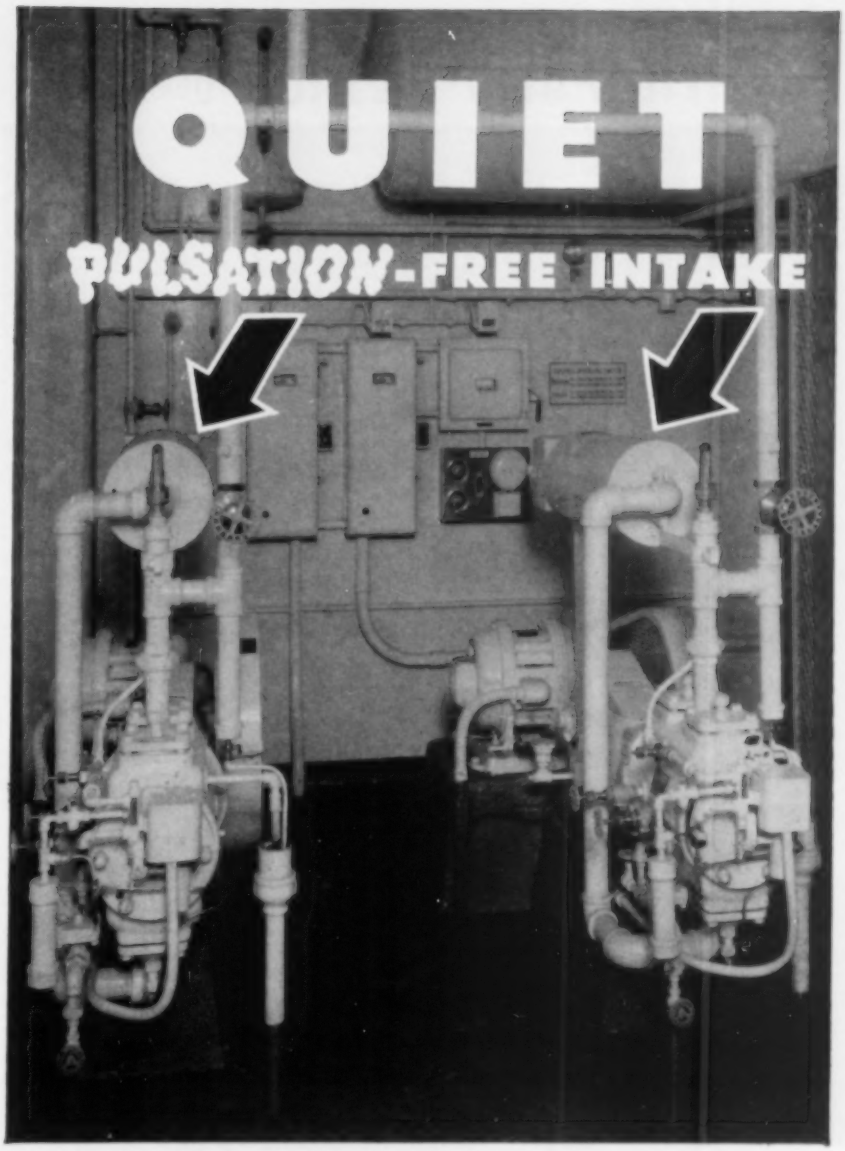
Vermiculite saved a steel plant a lot of time, trouble and expense in the case of a 15-ton ingot that was cast in one mill and processed in another 200 miles distant. Normally, the mass of metal would have undergone a 6-week cooling

period before shipment; then it would have had to be reheated for ten days to get it ready for manufacture. In this case the ingot was loaded while still white-hot in a gondola car half full of expanded vermiculite which, with its multiplicity of tiny air holes, is an excellent insulator. On top of it was placed a thick layer of the same material, which kept the metal hot throughout its trip and in condition for immediate use.

We have heard of blanketing the earth with pulverized coal to stimulate plant growth by checking weeds and keeping heat and moisture in the ground. Now the same thing is being done with strips of aluminum foil laid between rows of vegetables. Research men of the Virginia Truck Experiment Station report that the use of foil increases initial growth, plant development and yield. Up North, in Alaska, Dr. Basil Bensin raises seedlings in cold frames lined with aluminum foil and painted black on the outside. These he transplants outdoors in raised rows towards which the sun's rays are reflected by aluminum foil stretched on wooden frames, which also serve as windbreakers. In this way he expects to prolong the normally short growing season by 20 percent.

An overhead cable conveyor for both light- and heavy-duty service has been announced by Daigle-Gaboury, Inc., after practical application to test its merits. The components of the system, which is said to represent a departure in materials handling, are cast-steel wheels, a split trolley bracket, a self-locking split retaining nut with precision-machined tapered threads, and a 9/16-inch steel-core cable weighing 0.56 pound per foot and having a yield strength of 29,000 pounds. The bracket assembly has a sleeve that is internally serrated and externally tapered and threaded. With the cable in the sleeve, the split nut is brought together and turned on the ex-





with

MAXIM SILENCERS

● Maxim makes silencers for compressor intake, vacuum pump discharge, blower intake or discharge, internal combustion engine exhaust or intake, high velocity steam, air or gas discharges, spark arresting and heat recovery silencers.

Consult MAXIM

THE MAXIM SILENCER COMPANY
Dept. W.L., 61 Homestead Ave., Hartford 1, Conn.

Gentlemen: Please send me your bulletin on silencers for
☐ Compressor Intake ☐ Internal Combustion Engines
☐ Steam Blow-off ☐ Spark Arresting ☐ Heat Recovery.

Name _____

Company _____

Address _____

_____

4MX52

THE VICTAULIC METHOD OF PIPING

EASIEST WAY TO MAKE ENDS MEET

Sizes ¾" through 60"

TEES . . . ELBOWS . . . REDUCERS . . . the Victaulic Method features a complete line of modern, top efficiency, Full-Flow Fittings for use with world famous Victaulic Couplings!

The Victaulic Method assures a complete, modern system of piping . . . fast, efficient hook-ups that simplify and streamline construction . . . cut costs! Victaulic Couplings offer easy-to-install, leak-proof connections . . . a union at every joint . . . assured trouble-free service under pressure or vacuum. Victaulic Full-Flow Fittings specially designed for use with Victaulic Couplings provide wide adaptability and complete versatility in construction. And to make the Victaulic Method complete—"Vic-Groover" Tools groove standard pipe easily and quickly . . . provide handy, portable equipment for preparing pipe right on the job!

Try the VICTAULIC METHOD on your next piping job. New construction . . . repairs . . . alterations—you'll find that the Victaulic Method *is the easiest way to make ends meet!*

Write today for Victaulic Catalog and Engineering Manual No. 44-8B

VICTAULIC
COMPANY OF AMERICA
P. O. Box 509 • Elizabeth, N. J.
Office and Plant: 1100 Morris Ave.
Union, N. J.
Telephone: Elizabeth 4-2141

28th VICTAULIC YEAR

California: Victaulic Inc., 727 W. 7th St., Los Angeles 14
Canada: Victaulic Co. of Canada Ltd., 406 Hopewell Ave., Toronto 10
Export: Pipe Couplings, Inc., 30 Rockefeller Plaza, N. Y. 20, N. Y.

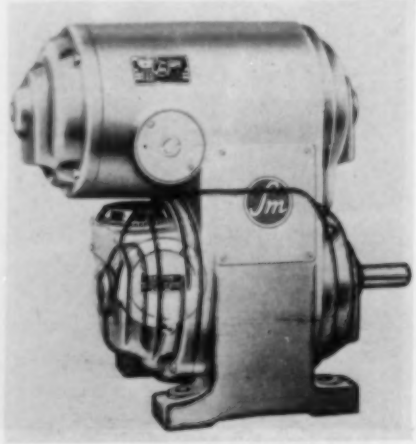
Copyright 1952, by Victaulic Co. of America.

panding threads of the taper, thus exerting 360° compression on the sleeve and causing its serrations to take a biting hold on the cable. It is claimed that trolley brackets in this fixed position have withstood "pull loads" up to 10,800 pounds without indication of slippage.

Shown here is a new atomizing nozzle with separate inlets for air and liquid in the top of the body and at right angles to the spray. This arrangement is said to simplify mounting in the case of special installations. It is made by

Spraying Systems Company in two models: ⅛ JACN with a shutoff needle valve and ⅛ JAC without that feature. Capacities and types of spray depend upon the fluid and air-nozzle assemblies. Pressure and siphon outfits are available.

A variable-speed drive with mounting dimensions that permit interchange with NEMA standard motors has been announced by Sterling Electric Motors. The new drive consists of a variable-speed transmission with positively adjusted pulleys and an induction motor built in a compact unit. It is intended to save machinery manufacturers the cost of providing special bases where interchangeability with variable-speed drives and NEMA standard motors is required. Single-phase units are available in sizes from 1 to 3 hp and polyphase from 1 to 15 hp in dripproof, splashproof and totally enclosed designs with 2-1, 3-1 or 4-1 speed variation.



Books and Industrial Literature

The fifth edition of *Practical Metallurgy for Engineers* has been issued by the research staff of E. F. Houghton & Company, 303 W. Lehigh Avenue, Philadelphia 33, Pa. The 599-page handbook presents the latest standards and practices followed in the metal industry today; discusses the potentialities of new metals, alloying elements and heat treatments; and includes a chapter on flame and induction heating. Obtainable from Houghton & Company. Price, $3.50.

Canal Linings and Methods of Reducing Costs is the title of a booklet compiled by the U. S. Bureau of Reclamation after six years of experimentation and research in the field of irrigation. It deals with many kinds of canal-lining materials and methods of application under varied conditions and includes data relative to installation costs. The 70-page illustrated publication may be obtained for 25 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., or from L. N. McClellan, Chief Engineer, Bureau of Reclamation, Denver Federal Center, Denver, Colo.

Tubular Exchanger Manufacturers Association, Inc., has announced the release of the third edition of its heat exchanger standards, an extensively revised and enlarged volume that brings together all the findings and conclusions of the TEMA technical committee made up of representatives of leading manufacturers in the field. It includes two new sections relating to the mechanical standards for alloy-steel heat exchangers and general information valuable to designers, fabricators and users of heat exchangers. Copies of the 162-page book is available to nonmembers from the Association, 53 Park Place, New York 7, N. Y., at the publishing cost of $5.50, postpaid.

For those who want to be well informed on the subjects of magnesium and aluminum, their alloys and industrial applications, the Government is offering two new handbooks prepared under the direction of the Army's Research and Development Laboratories in co-operation with the Magnesium Association and three of the country's leading aluminum-producing companies. *The Magnesium Symposium*, a 64-page work, sells for $2, and *The Aluminum Symposium* of 142 pages costs $3. Both contain illustrations, drawings, graphs and tables and are obtainable by sending check or money order, made payable to the Treasurer of the United States, to the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

The work involved in selecting gauge blocks to obtain a combination of the desired length for gauging is greatly simplified by a book containing height-combination tables prepared by the DoALL Company, Des Plaines, Ill. The tables are carefully worked out listings of gauge blocks to be used in constructing combinations for any dimension from one ten-thousandth of an inch to one inch in steps of one ten-thousandth. The user just refers to the desired dimension and chooses the blocks listed for that dimension. Included in the publication is a heat-expansion calculator which gives the corrections that must be made for differences in the coefficient of expansion between gauge blocks and parts, other than steel, that are being checked with the blocks. The book is entitled *Height-Combination Tables—Heat-Expansion Calculator* and is sold through all DoALL sales-service stores for $2.95.

A 6-page folder—51B6210D—recently announced by Allis-Chalmers, Milwaukee 1, Wis., deals with the engineering and construction features of its ½- to 100-hp dripproof and splashproof squirrel-cage industrial motors.

With its new 12-page illustrated catalogue, identified as Section 303, Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass., offers design engineers a complete file on its line of air valves. Copies will be sent free on request.

Specific data on industrial rubber-hose assemblies for all types of mining and construction equipment are contained in an 8-page publication being distributed by Carlyle Rubber Company, 64 Park Place, New York 7, N.Y. Write to Department J-3 for your copy.

Bulletin No. 290, just released by A. W. Cash Valve Manufacturing Corporation, Decatur 60, Ill., describes a new safety relief valve for hot-water boilers, tanks and heaters. Identified as Type F 51, the valve is said to have the highest Btu discharge rate of any of comparable size on the market.

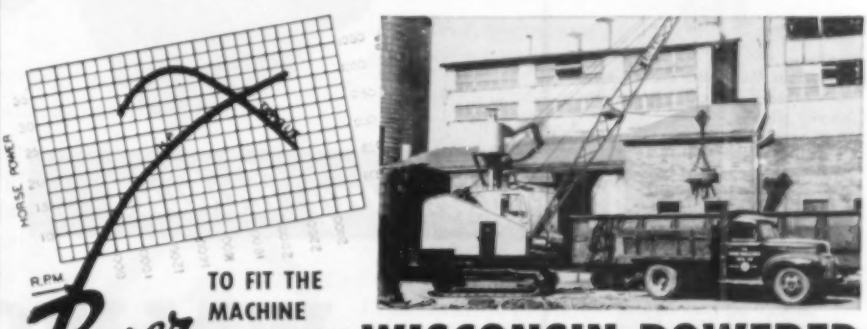
A 4-page bulletin on metallizing, available on request from Metalweld, Inc., 26th and Hunting Park Avenue, Philadelphia 29, Pa., describes how the process can be used for making mechanical repairs, for protecting surfaces against corrosion, and for a variety of industrial-maintenance services.

A brochure that describes methods of reducing decorative spray-painting costs is obtainable free upon request from Conforming Matrix Corporation, Factories Building, Toledo 2, Ohio. The subjects covered include electroformed metal masks, foot-controlled and pneumatic fixtures, fully automatic spray equipment, mask washing machines and air-operated clamps and tools.

Scientific Cleaning for Modern Metal Finishing is the title of a new brochure published by Kelite Products, Inc., 1250 N. Main Street, Los Angeles 12, Calif. It deals with the company's various cleaning compounds and methods of application and discusses 23 difficult processing jobs encountered in metalworking industries. Specify Bulletin 121 when writing for a copy.

Brown indicating and recording pressure gauges with pneumatic control are dealt with in Specification Sheet 710 obtainable from Minneapolis-Honeywell Regulator Company, Station 40, Wayne and Windrim Avenues, Philadelphia 44, Pa. Included are construction and engineering details of these gauges, which are furnished in a variety of ranges as indicating or as one- or two-pen recording controllers.

Ingersoll-Rand Company has published a 36-page catalogue covering its line of multicycle electric tools. It contains separate sections on Impactools, nut runners, drills, screw drivers, grinders, buffers, sanders and polishers. More than 100 different sizes are listed, covering both 180- and 360-cycle models with equipment and accessories. Write the company, 11 Broadway, New York 4, N. Y., or the company's nearest branch office for Form 5111.



Power TO FIT THE MACHINE AND THE JOB **WISCONSIN-POWERED**

Power Plants, Inc. Generator

Three carloads of scrap travel fast from freight cars to trucks every day with this crane on the job. It's equipped with a 36" ECM magnet, and the generator, built by Power Plants, Inc., Cleveland, Ohio, is powered by a Wisconsin Air-Cooled Engine.

Over and above time and labor saved through Wisconsin Engine dependability, servicing and maintenance are reduced to a minimum. For example, bearing failure is unheard of due to tapered roller bearings at both ends of crankshaft. Fool-proof air-cooling means no winter freeze-ups or summer overheating. And an easily-serviced OUTSIDE magneto with impulse coupling delivers all-weather quick starts. These features, combined with rugged construction, are the basis for the most dependable, most versatile power in the 3 to 30 hp. range . . . WISCONSIN POWER.

Write for details covering 4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models.

MOST H.P. HOURS

WISCONSIN MOTOR CORPORATION

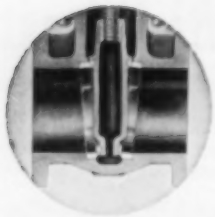
World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

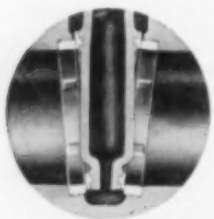
WALWORTH

iron body gate valves

with screwed or flanged ends



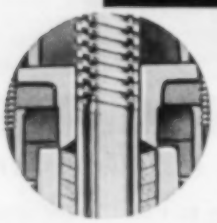
Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



Seat Rings of end-seated type are screwed into the body.

Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.

... 8 Outstanding Features



Brass Liner on Glands assures greater resistance to corrosion and scoring.

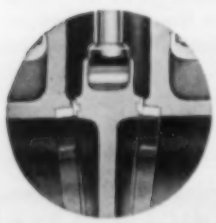
For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.

WALWORTH

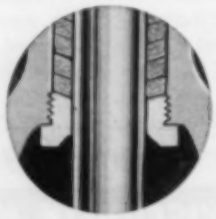
valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

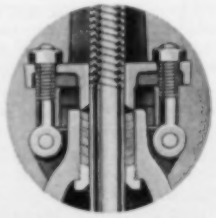


T-head Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.



Bronze Back-Seat Bushings in bonnets of OS&Y valves.

Solid Web Type Disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

Koppers expands service on American Hammered

Industrial and Aircraft Piston Rings

BECAUSE of the sale of its automotive replacement piston ring business Koppers now is in a position to further increase its leadership in piston and sealing rings for aircraft, general industrial, marine, commercial engine, railroad and oil field applications.

To present and prospective users of Koppers American Hammered Industrial Rings, this means increased engineering service, through concentrated attention to the solution of industrial and aviation ring problems; and greater production capacity for both original equipment and replacement rings. Our available manufacturing facilities include:

A large foundry equipped for both static and centrifugal casting . . . a modern heat-treating plant . . . one of the largest and most up-to-date chromium plating plants . . . modern machine shops . . . an efficient engine test laboratory . . . a modern and complete piston ring research laboratory.

In industrial and aviation rings, American Hammered *means* Koppers . . . builders of *engineered* products for industry.

Write, wire or phone us for the right answer to your piston or sealing ring problems, today. KOPPERS COMPANY, INC., *Piston Ring Department*, 1517 Hamburg Street, Baltimore 3, Maryland.

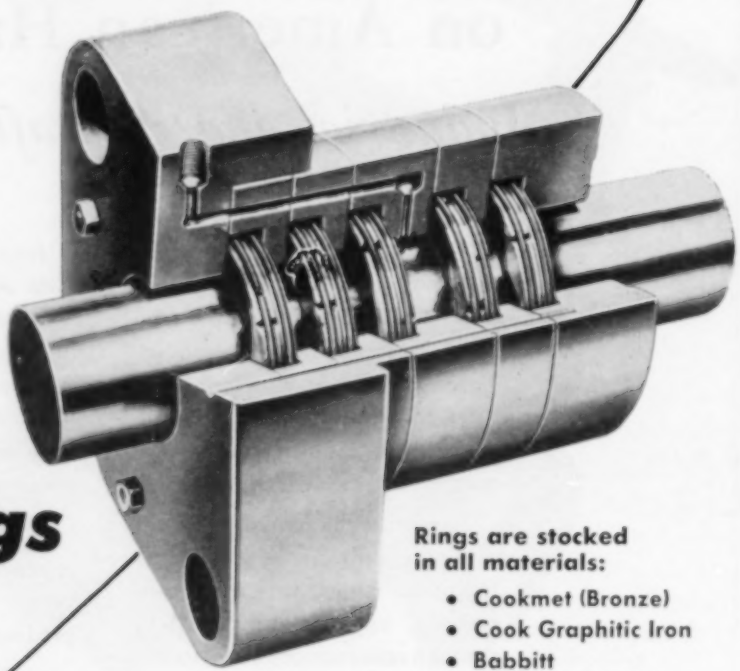
KOPPERS

Koppers American Hammered Industrial Piston Rings

Only KOPPERS *can furnish K-Spun and Porous Chrome!*

PLAY SAFE

...insist on COOK Metallic Rod Packings



Rings are stocked in all materials:

- **Cookmet (Bronze)**
- **Cook Graphitic Iron**
- **Babbitt**
- **Cookroc (Bakelite)**

COOK METALLIC ROD PACKINGS are supplied as standard equipment in most leading make compressors of advanced design. The overwhelming acceptance is significant. It means that over the years these modern rod seals have consistently given efficient, trouble-free results in virtually every type of service. This record stands as your assurance of getting the best in packing performance if you specify Cook Metallic Packings when ordering new equipment. There's a proven style and size for almost every gas, temperature, pressure and speed and for every make compressor.

C. Lee Cook Mfg. Company, Incorporated, Louisville, Ky. Branch offices in Baltimore, Boston, Chicago, Cleveland, Houston, Los Angeles, Mobile, New Orleans, New York, San Francisco and Tulsa

COOK

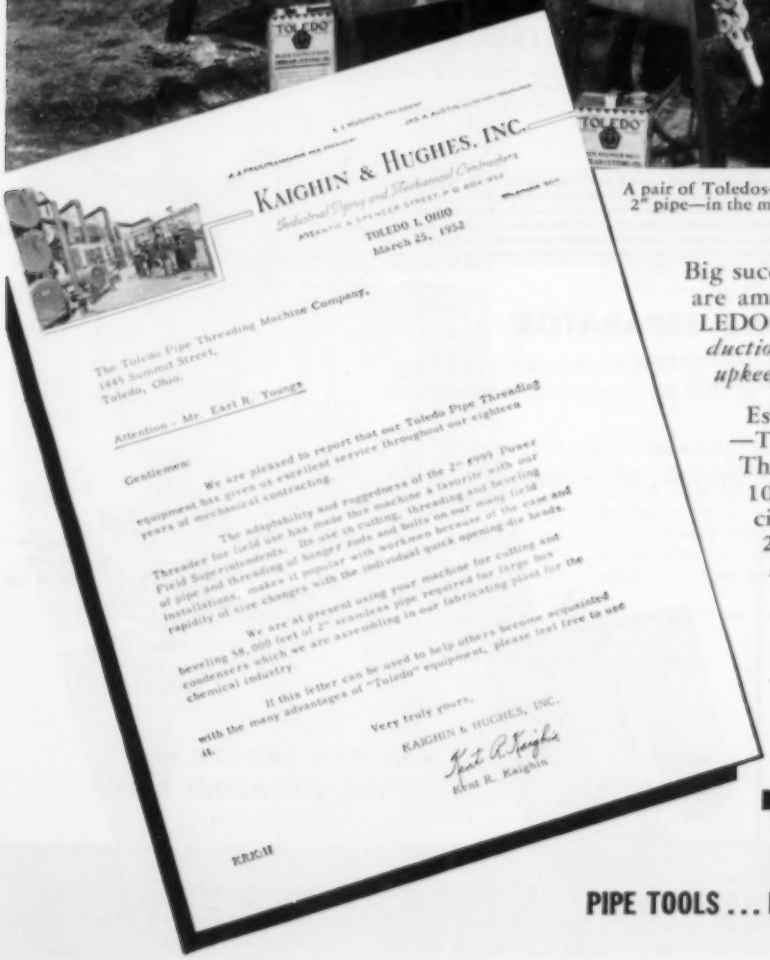
ROD PACKINGS

. . . SEALING PRESSURES SINCE 1888 . . .

"TOLEDO No. 999 2" POWER THREADER *a favorite with Field Superintendents!"*

. . . says 18-YEAR USER

A pair of Toledos—No. 1-2-4 (at left) for 1" to 4" pipe; and No. 999 for up to 2" pipe—in the modern pipe shop of Kaighin & Hughes, Inc., Toledo, Ohio.



KAIGHIN & HUGHES, INC.
Industrial Piping and Mechanical Contractors
ATLANTIC & SUMMER STREET • P. O. BOX 352
TOLEDO 1, OHIO
March 25, 1952

The Toledo Pipe Threading Machine Company,
1445 Summit Street,
Toledo, Ohio.

Attention - Mr. Earl R. Youngs

Gentlemen:

We are pleased to report that our Toledo Pipe Threading equipment has given us excellent service throughout our eighteen years of mechanical contracting.

The adaptability and ruggedness of the 2" 999 Power Threader for field use has made this machine a favorite with our Field Superintendents. Its use in cutting, threading and beveling of pipe and threading of hanger rods and bolts on our many field installations, makes it popular with workmen because of the ease and rapidity of size changes with the individual quick opening die heads.

We are at present using your machine for cutting and beveling 58,000 feet of 2" seamless pipe required for large box condensers which we are assembling in our fabricating plant for the chemical industry.

If this letter can be used to help others become acquainted with the many advantages of "Toledo" equipment, please feel free to use it.

Very truly yours,
KAIGHIN & HUGHES, INC.
Earl R. Kaighin

ERKH

Big successful outfits like Kaighin & Hughes, Inc., are among the many users who have found TOLEDO Power Pipe Machines "tops" for *high production . . . easy operation . . . long life . . .* and *low upkeep.*

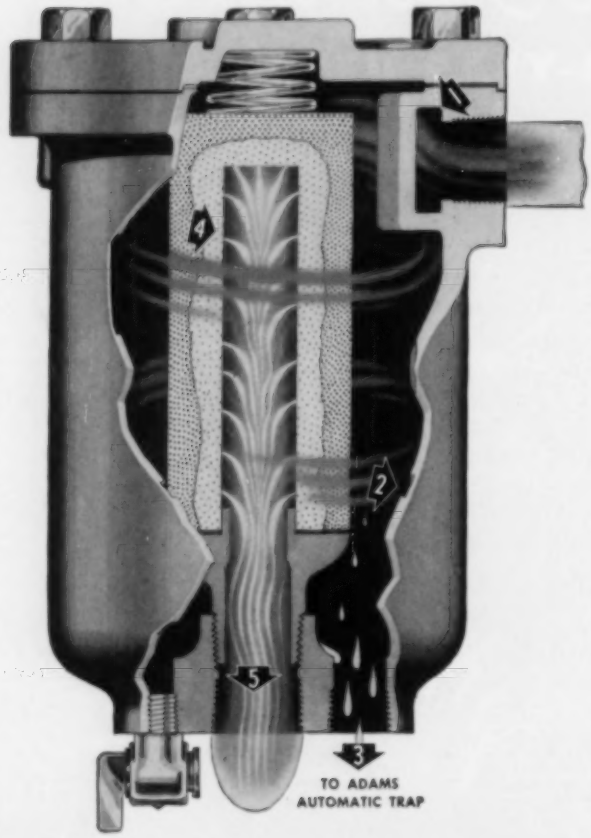
Especially popular in pipe shops or in the field —Toledo No. 999 2" Portable Power Threader! Threads 2" pipe in 22 seconds . . . cuts off in 10 seconds. *Built to last* with the rugged precision of a fine lathe. Many No. 999's in use 20 years *and more!* This means *lower cost to own*—another advantage of Toledo dependability! Write for new catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

50 Years of Leadership

TOLEDO

PIPE TOOLS . . . POWER PIPE MACHINES . . . POWER DRIVES

ADAMS *has both* *



—— BOTH ANSWERS TO THE PROBLEM OF KEEPING WATER, WATER VAPOR, OIL AND DIRT OUT OF COMPRESSED AIR LINES

There's no *one* answer to this problem! The most expensive aftercooler you can buy will not remove scale that is picked up in the distribution lines. The most expensive air filter you can buy cannot guarantee removal of water vapor until it has been condensed by cooling. That's why Adams makes both.

* PORO-STONE *AIR FILTER*

1. Centrifugal separation of dirt and liquids.
2. Drainage to trap directed by vertical cast-in slots.
3. Continuous, fully automatic trap action.
4. Rapid diffusion and filtration through permanent, cleanable Poro-Stone.
5. Clean, dry air at practically unchanged pressure. Standard, stocked sizes handle from 10 to 700 cfm.

Easily installed in either vertical or horizontal pipe line.

* *AFTERCOOLER AND CYCLONE SEPARATOR*

Cools air to within a few degrees of cooling water, making certain that compressed air is colder than surrounding atmosphere, so that no further condensation can take place.

Counter flow, air-through-tube design assures continuously high heat transfer rate.

Double cyclonic action deposits all water and entrained oil in moisture chamber.

R. P. ADAMS CO., INC.
209 E. Park Drive, Buffalo 17, New York

Please send me your latest literature, Bulletin No. 176 on BOTH the Poro-Stone air filter and the Adams Aftercooler — Cyclone Separator.

Name.....

Company..... *Title*.....

Address.....

City..... *State*.....

FOR YOUR PROFIT'S SAKE — FIND OUT ABOUT BOTH

R. P. ADAMS CO., INC., BUFFALO 17, N. Y.

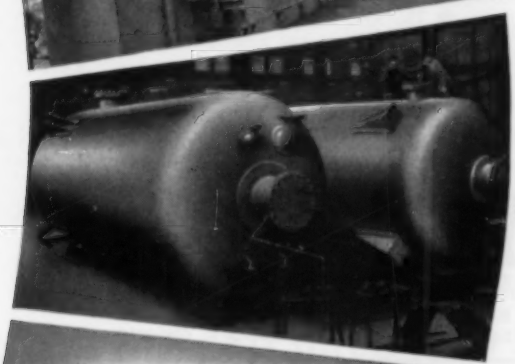
USE THESE BETTER

Vogt Products

For Today's Tough Service Demands

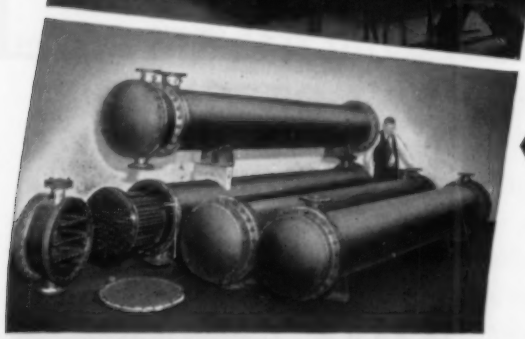
EFFICIENT AND DEPENDABLE STEAM GENERATION

Vogt steam generating units are designed to give maximum rating in a minimum of space with high efficiency and low maintenance expense. Bent tube types and straight tube, forged steel sectional header types to burn solid, liquid or gaseous fuels, as desired, meet every power, heating or process requirement.



PROCESS EQUIPMENT FOR EVERY SERVICE

Stills, towers, oil chilling machines, filter presses, heat exchangers, etc. are constructed to all Codes. They meet all demands for operating security and trouble-free performance and help to lower costs in important process industries around the world.

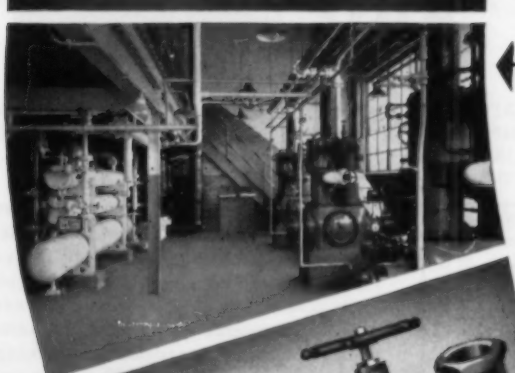


SPECIAL MATERIALS FIGHT CORROSION AND PRODUCT CONTAMINATION

Our modern shops produce a wide variety of equipment made from special metals and alloys to combat corrosion, and product contamination or discoloration. Fabrication procedures employed insure that corrosion resistant properties of welds will match that of the materials from which units are constructed.

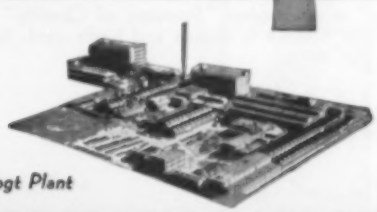
MORE TONNAGE AT LESS COST

Over 60 years of manufacturing experience, engineering and research stand behind Vogt refrigerating and ice making machinery. Absorption Systems, Compression Systems, and the Automatic Tube-Ice Machine in a wide range of capacities serve in leading petroleum refineries, chemical plants, ice and cold storage plants, dairies, packing plants, etc., at home and abroad.



DROP FORGED FOR EXTRA TOUGHNESS AND LONG-TIME SERVICE

Vogt valves, fittings and flanges, for top performance in oil, water, air, gas, and ammonia services, at high or low pressures and temperatures, are available drop forged entirely from carbon steel or stainless steel. Valves can be furnished in a combination of materials by using stainless steel for parts affected by service temperature or corrosion, and less expensive alloys or carbon steel for other parts.



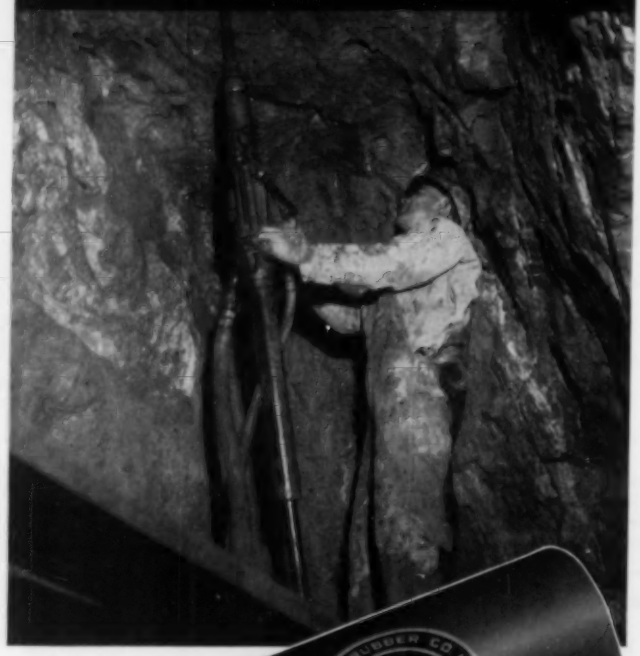
Air View of Vogt Plant

HENRY VOGT MACHINE CO.

LOUISVILLE 10, KENTUCKY

BRANCH OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO, ST. LOUIS, DALLAS

"MINE KING"



The AIR HOSE *That Cuts Drilling Costs Three Ways*

Use of "MINE KING" Air Hose assures important economies in drilling operations, regardless of conditions.

Its tougher, more durable construction keeps it on the job longer —a saving in hose replacement costs.

Extreme flexibility provides easier handling and facilitates drilling in tight spots and coiling for transport.

Availability in extra long lengths reduces the need for intermediate connections to an absolute minimum — fewer couplings required — less time for setting up the lines.

"Mine King" is a Goodall "Standard of Quality" product, made in sizes ½", ¾" and 1", double and triple cord, maximum lengths of 500 feet.

Contact Our Nearest Branch for Prices

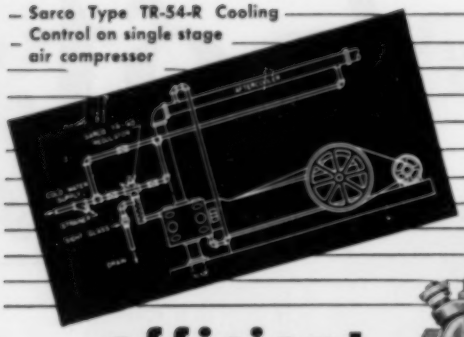
GOODALL RUBBER COMPANY

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

Branches: Philadelphia · New York · Boston · Pittsburgh · Chicago · Detroit · St. Paul · Los Angeles
San Francisco · Seattle · Portland · Salt Lake City · Denver · Houston · Distributors in Other Principal Cities

Est. 1870

— Sarco Type TR-54-R Cooling Control on single stage air compressor



Sarco TR-54-R

efficient COMPRESSOR COOLING

- Do you want to avoid over — or under — cooling?
- Do you want to save cooling water and lubricants?
- Do you want to increase the efficiency and life of your air compressor? . . . then install SARCO COOLING CONTROLS

Simple • Self-operated • Inexpensive

Ask for Bulletin No. 701

SARCO COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N.Y.

Represented in Principal Cities
SARCO CANADA LTD., TORONTO 5, ONTARIO

518

COMPRESSED AIR AND GAS COME OUT OF THE LOGAN

ARIDIFIER

Scrubbed CLEAN AND DRY

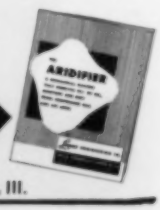
INSTALL ARIDIFIERS ON LINES SERVING

- Paint Spray Guns
- Air Tools
- Air Hoists
- Foundry Jogging Machines
- Sand Blasting Tools
- Sand Blasting Rooms
- Metal Spray Guns . . . or Wherever the line must deliver clean, dry air or gas

On any air or gas line 92% of the dirt, oil, scale and water that enter the Aridifier is trapped and removed from circulation. The Aridifier's patented centrifugal-baffle action scrubs air and gas clean and dry . . . protects equipment, prevents freezing, fouling, corrosion and caking, produces best results with spray gun and air tool operations, etc. Easy to install. Self cleaning. Maintains itself. 10 models available. Capacity 7 CFM to 17,000 CFM.

Learn HOW the Aridifier scrubs with a patented centrifugal-baffle action.

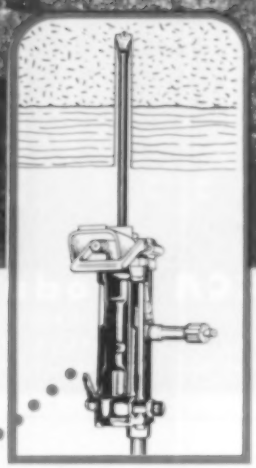
Write for This Catalog Now!



Logan ENGINEERING CO.

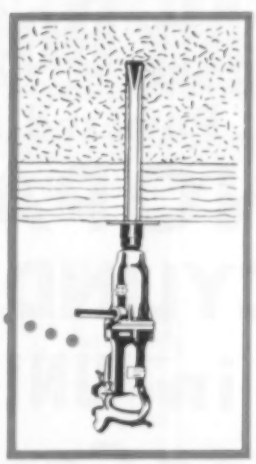
4915 W. Lawrence Ave., Chicago 30, Ill.

for "LOW OVERHEAD" in
ROOF BOLTING



do the *whole job* quicker and easier, with this three-way Ingersoll-Rand ROOF BOLTING COMBINATION

RP-38 "SHORT-LEG" STOPER, for drilling bolt holes and driving wedge type roof bolts. The light weight and excellent balance of this ultra-compact stoper permit easy handling in seams as low as three feet. It has positive, automatic rotation for fast bolt-hole drilling and plenty of power for driving the bolts into the hole. For extra-heavy drilling, the slightly larger Model RP-48 Stoper can be used.



SIZE 534 IMPACT WRENCH, for tightening and locking the roof bolts. This heavy-duty air powered tool gives a far greater torque impact than any other portable wrench of its size and weight. Extra deep sockets are available to permit tightening nuts over extended bolt ends.

CARSET JACKBITS, for faster, easier drilling in any type of ground. These bits, with super-hard tungsten carbide cutting edges, practically eliminate bit changing—have no appreciable gauge wear, increase drilling speed 50% or more. Steel bits available where needed.

Ask your I-R representative for complete information on this service-proved Ingersoll-Rand Roof Bolting Combination.

Ingersoll-Rand

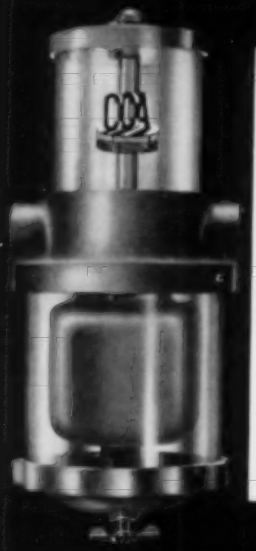
11 Broadway, New York 4, N. Y.

746-5

ROCK DRILLS • COMPRESSORS • AIR-TOOLS • CENTRIFUGAL PUMPS • TURBO BLOWERS • CONDENSERS • DIESELS • GAS ENGINES

ONE UNIT **FILTERS AND LUBRICATES** COMPRESSED AIR

COMBINATION { **FILTER** **LUBRICATOR**



ENTIRE OPERATION IS VISIBLE!

You can't beat this for efficiency. The single, compact unit filters the air and disperses the correct amount of atomized oil. Transparent bowl enables you to see when new oil supply is needed and when glove needs replacement. Made in pipe sizes from ¼" to ¾". The CCA Filter-Lubricator can be installed in an air line with two simple pipe connections. Limited quantities shipped from stock.

Write for catalog

CCA Products Division

BRECO MANUFACTURING COMPANY

309 East Saratoga St., Baltimore 2, Maryland

Dealer franchises available in certain territories. Write or wire Sales Manager.

SAUERMAN

Power Drag Scrapers

Photo shows Sauerman Scraper stocking out coal at large power plant. Building a high, compact pile 350 ft. in radius, this scraper stores and reclaims at rate of 250 t. p. h.

Whatever your material—ore, coal, boulders, sand, gravel, clay—you can move it fast and efficiently with a long range Sauerman machine of either cableway or scraper type—at a great saving in cost. Any mechanic can operate it. Upkeep is simple. Machine is flexible: range is easily extended. Sturdy design and construction for long service. Bucket sizes run from ⅓ to 15 cu. yd.; spans range up to 1,000 ft.

WRITE TODAY FOR LATEST CATALOG

SAUERMAN BROS., INC. 548 S. CLINTON ST. CHICAGO 7, ILL.

Small Sauerman Scraper Handles 30,000-Ton Stockpile. Storing and Reclaiming 400 tons a day.

"Air Dogs" Powered by NOPAK CYLINDERS in "UNION" Log Carriage...

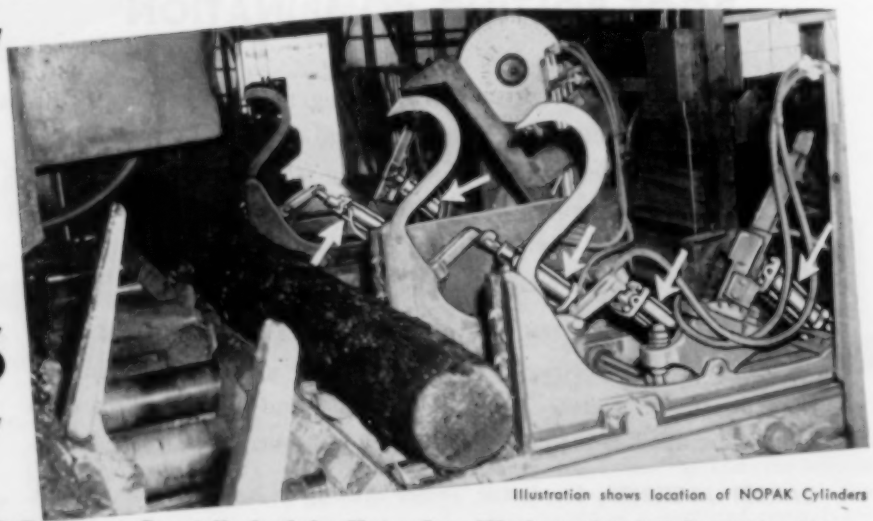


Illustration shows location of NOPAK Cylinders

Specially built by Union Iron Works is this 6 ft. Band Headrig and Log Carriage, equipped with electric setworks and feedworks, installed at the Smith-Nielsen Mill, Spalding, Idaho. All of the "Air Dogs", however, are actuated by NOPAK Model "E" Air Cylinders, with Pendulum Mounting for oscillating movement.

This is one of many similar applications of NOPAK Cylinders and Valves, in heavy-duty lumber mill equipment. It may suggest how you can use air power effectively in vital machine movements . . . in your plant, or in equipment you build for your customers.

For Technical Data on NOPAK Valves and Cylinders, refer to Sweet's File for Product Designers, or write for Bulletin SW-1.

NOPAK

VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

GALLAND-HENNING MFG. COMPANY

2759 SOUTH 31ST STREET • MILWAUKEE 46, WISCONSIN

Representatives in Principal Cities

Specify SQUARE D Motor Starters for 3 Important Reasons

Easy to Wire!
Easy to Get At!
Easy to Live With!

Write for Bulletin 8536. It tells the complete story.
Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

Prolong Tool Life...

CUT REPAIR COSTS WITH "OILED AIR"* FROM Arnold Lubricators

With patented ARNOLD LUBRICATORS in your pneumatic tool lines, the flow of "oiled air" to working parts starts automatically when air tool starts, gives you "oiled air" where needed, when needed.

Oil reservoir can be filled under line pressure; pressure-proof window tells you when. Patented adjustable feeder enables you to adjust "oiled air" flow to job needs.

Made of strong, light-weight alloy so they do not drag on line; shaped to prevent catching. No needle valve or moving parts to get out of order. Four sizes. Easily installed. Pay for themselves in repair savings.

→ **Order from your equipment dealer TODAY or write us for leaflet and prices.**

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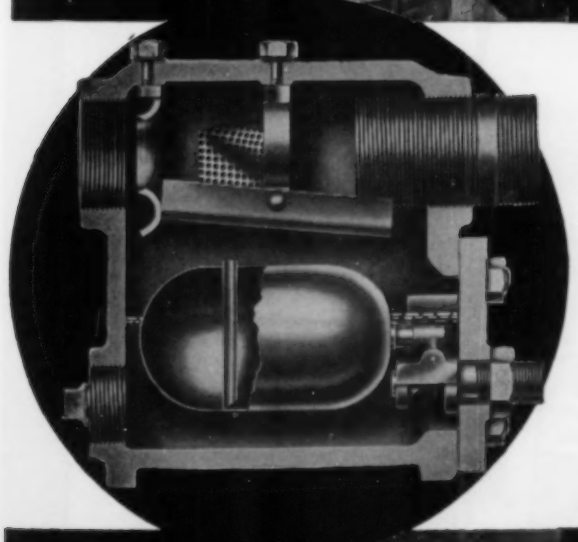
THE RUCKER COMPANY
4228 HOLLIS STREET • OAKLAND 8, CALIFORNIA

DRI AIR MAY BE INSTALLED BY SUSPENDING IT FROM THE PIPING WITHOUT ANY OTHER SUPPORT.

INCREASED PNEUMATIC EFFICIENCY WITH THIS AUTOMATIC SEPARATOR



PROTECT EQUIPMENT WITH

DRIAIR

SEPARATES • COLLECTS • DELIVERS

• DriAir separates and automatically ejects the condensed water and oil from compressed air lines, collects pipe scale and rust, delivers clean dry air to tools and other pneumatic equipment. This promotes better lubrication, reduces wear, increases life of tools and produces greater output. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent.

A TYPICAL INSTALLATION SHOWING DRI AIR STANDING ON A CONCRETE FLOOR NEXT TO THE WALL.

WRITE FOR BULLETIN DA WHICH FULLY DESCRIBES THE CONSTRUCTION AND OPERATION OF THE DRIAIR.

NEW JERSEY METER CO.

"SPECIALISTS IN COMPRESSED AIR DEVICES"

PLAINFIELD, NEW JERSEY

IT'S NIGH ON 100 YEARS

SINCE LAKE SHORE STARTED MAKING MINING MACHINERY 1858 TO BE EXACT.

THAT MEANS A VAST ACCUMULATION OF EXPERIENCE AND KNOW HOW. IT GIVES YOU ASSURANCE OF RELIABLE, WELL ENGINEERED MINING MACHINERY.

SKIPS - HOISTS - CARS - IDLER AND BICYCLE SHEAVES - CAGES - CONVEYORS - SPECIAL MACHINES - ANYTHING AND EVERYTHING NEEDED IN MINING MACHINERY. STURDY PRODUCTS THAT ARE IN USE THROUGHOUT THE WORLD.

WHEREVER YOU ARE - OR WHATEVER YOUR NEEDS IN MINING MACHINERY OR EQUIPMENT, LAKE SHORE CAN FILL YOUR REQUIREMENTS.

CONTACT OUR MINING DIVISION FOR COMPLETE INFORMATION ON ANY OF YOUR REQUIREMENTS.

LAKE SHORE ENGINEERING COMPANY
IRON MOUNTAIN, MICHIGAN

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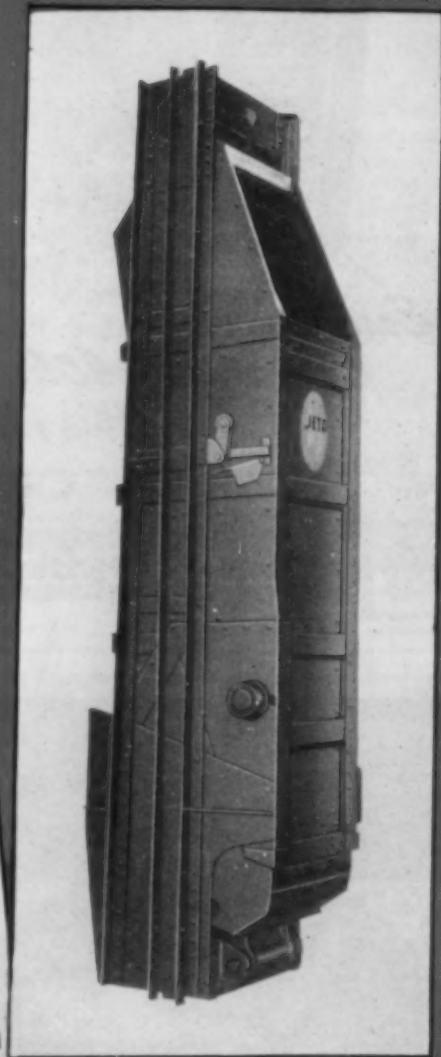
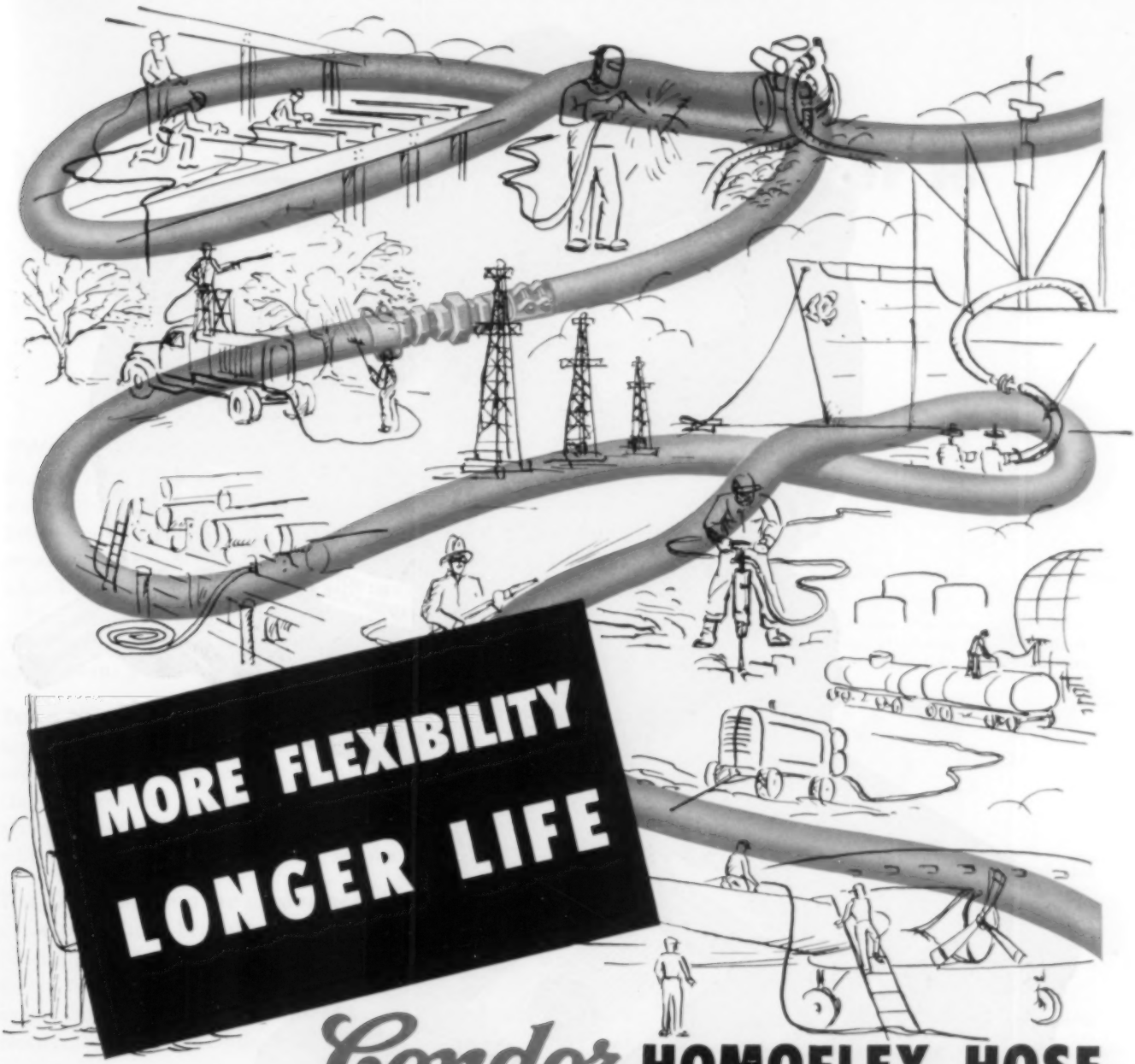
DIRECT ALL INQUIRIES TO IRON MOUNTAIN, MICHIGAN



NEW "JETO" BOTTOM DUMP SKIP

LAKE SHORE BICYCLE SHEAVE

THE LOHED MINE CAR

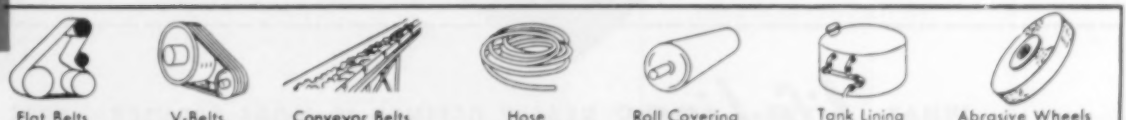


Condor HOMOFLEX HOSE

R/M engineers found a way to practically "homogenize" the wall of Homoflex Hose . . . By ingenious design, rubber tube and cover are blended together inseparably. The result, a hose wall with no pre-set twist, or stiffness. That's why Homoflex Hose is flexible as a rope, light and easy to coil and uncoil. Naturally, it lasts longer too. Made for air, water and other standard uses, Homoflex Hose has additional advantages described in Bulletin 6879D. Write for a copy • As the background suggests, Raybestos-Manhattan makes hose for every use. Your R/M Distributor will show you samples and discuss construction advantages.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

WHAT *Life-Lines* REALLY DELIVER IS MORE SERVICE...LESS SERVICING

What *Life-Lines* really deliver is

...more service
...less servicing

"We can't afford equipment breakdowns. We manufacture ice cream making machinery and operate franchise stores throughout the country. Store operators know very little about maintenance. We *must* select equipment that assures trouble-free performance with minimum maintenance. That's what Life-Lines give us. That's why we standardize on them."

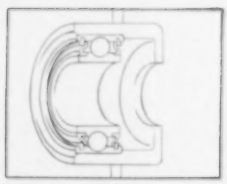
The above statement by the chief engineer of an eastern manufacturing plant tells the Life-Line story best. Summed up it means more service, less servicing with Life-Lines.

Take the Life-Linestarter®, for example. Contacts last longer because exclusive "De-ion®" arc extinction snuffs out arcs fast... reduces contact pitting. Simple seesaw balance of clapper prevents accidental opening; kickout spring prevents accidental closing. Compare with any other starter and see why Life-Linestarters offer *more service with less servicing.*

The Life-Line motor's advance design completely eliminates periodic lubrication. Pre-lubricated factory-sealed ball bearings need no greasing attention. Throw your grease guns away! Further, steel construction cuts breakage from rough usage. Superior insulation and winding techniques lengthen electrical life. On-the-job reports of a half million Life-Lines show why you get more service with less servicing.

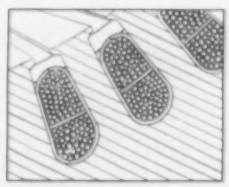
It costs no more to get Life-Line performance. Ask your Westinghouse representative for details or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-21684



MOTOR

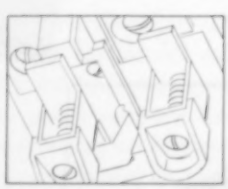
Needs no lubrication. Pre-lubricated factory-sealed bearings eliminate troubles due to under or overlubrication, dust and dirt.



Cuts winding burnouts. Pear-shaped slot design eliminates pockets. No corner voids remain to collect dirt, moisture.

STARTER

Never Jams. No sliding surfaces to wear—no sticking—no jamming—nothing to wear or replace.



Never needs filing. Silver-to-silver contacts eliminate filing. Discolored silver maintains high conductivity.

YOU CAN BE SURE...IF IT'S

Westinghouse

Life-Line

MOTORS and CONTROLS

teamwork in specialties

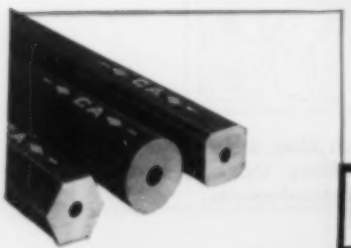
THE BLACKSMITH

Crucible Hollow Drill Rods

When the drill bit bites into rock, its hollow drill rod gets as many as 2500 wrenching impacts a minute. The blacksmith plays an important part in maintaining the quality of this steel. It's up to him to forge and temper it until it has exactly the right balance of surface hardness, toughness and fatigue strength. With Crucible Hollow Drill Rod, the blacksmith can count on getting this balance every time. For this drill rod is backed by Crucible's years of experience in specialty steel making.

Records of drilling operations prove Crucible Hollow Drill Rod's ability to take it. Service life is high; breakage and bit loss are at a minimum.

For long life and low maintenance, use Crucible Hollow Drill Rods.



CRUCIBLE first name in special purpose steels

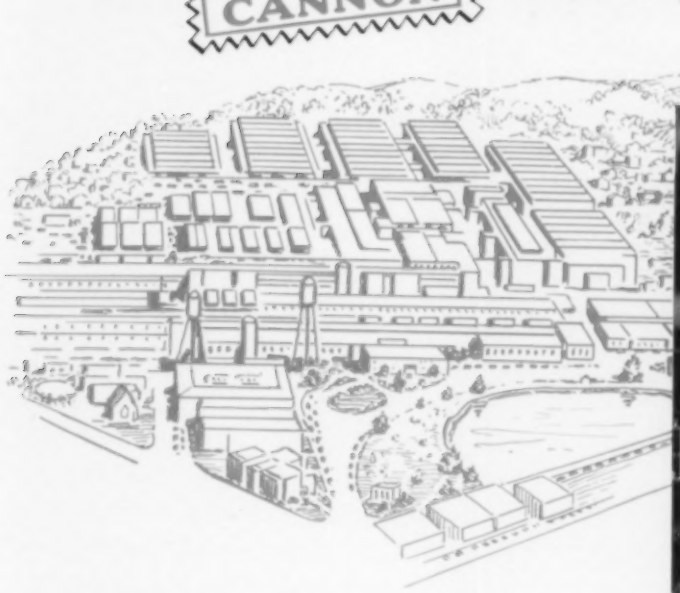
52 years of Fine steelmaking **HOLLOW DRILL RODS**

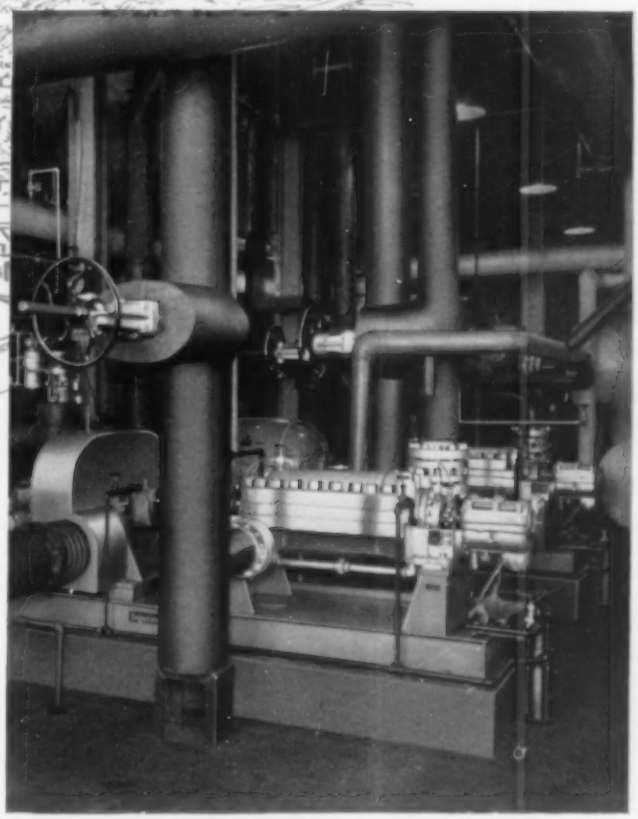
CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

HMTA PUMPS

feed new high pressure boiler at TRADE MARK MADE IN U.S.A. CANNON mills plant





Expansion program at world famous textile mill includes installation of newest design boiler feed pumps

Cannon Mills main plant at Kannapolis, N. C.—home of world famous linens and toweling—has been expanding steadily for the past three years. To meet its increased power needs, an additional 7500 kw turbine was put on line about a year ago.

Ingersoll-Rand Class HMTA boiler feed pumps were selected to serve this completely modern generating unit. The installation, shown above, includes two four-inch, 6-stage high pressure pumps, each capable of delivering 700 gallons per minute at 1700 feet total head. The main feed pump shown in foreground, is driven by a 400 hp steam turbine, while the duplicate standby unit has electric motor drive. These HMTA pumps, with I-R Unit-Type rotor assemblies, assure maximum continuity of service at sustained high efficiency and permit substantial savings in maintenance and inspection costs.

Ingersoll-Rand offers you a complete line of advanced design centrifugal pumps in types and sizes to meet every power plant and industrial requirement. Your nearest I-R representative will be glad to give you complete information.

COMPRESSORS • DIESELS • PUMPS
AIR AND ELECTRIC TOOLS
GAS ENGINES • ROCK DRILLS
CONDENSERS • VACUUM EQUIPMENT

Ingersoll-Rand

Cameron Pump Division
11 Broadway, New York 4, N. Y.

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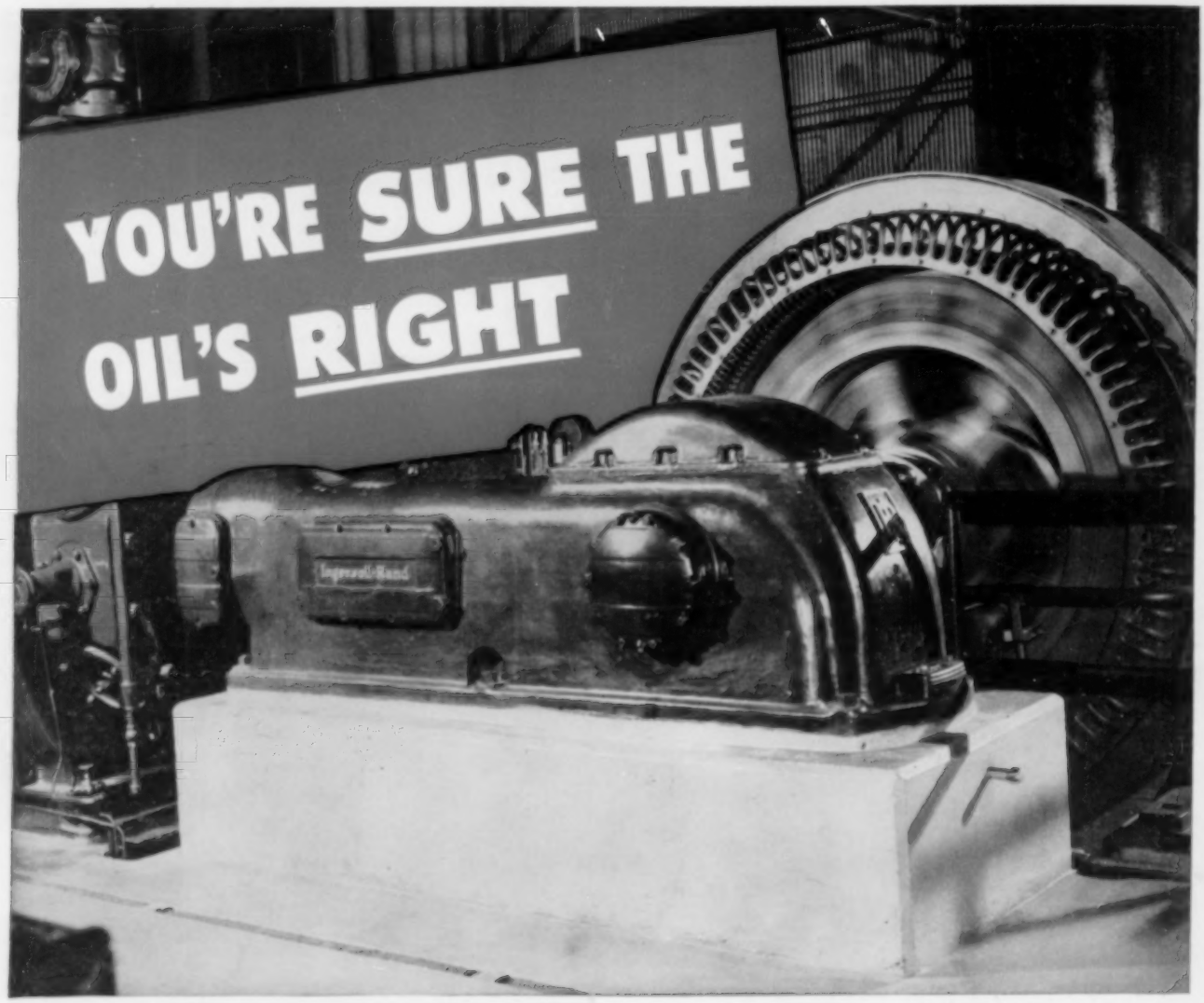

. . . when you rely on TEXACO

Clean, efficient, thrifty air compressor operation calls for different types of oil for different operating conditions. So Texaco makes a *complete line* of air compressor oils. You can get one that's exactly right for your compressors and operating conditions. A Texaco Lubrication Engineer will gladly help you. For example—

When you need an oil to overcome harmful carbon and gum in heavy service, a Texaco *heavy-duty* air compressor oil with extra oxidation resistance and detergency will be recommended. If your problem is keeping compressors and systems rust-free, the recommendation will be for a Texaco *rust-inhibited* air compressor oil.

When operating under "wet cylinder" conditions, your Texaco Lubrication Engineer will suggest a Texaco *compounded* air compressor oil to eliminate excess wear. And so-called "normal" conditions will call for a Texaco *straight mineral* air compressor oil.

Make use of Texaco Lubrication Engineering Service to step up your compressor efficiency and reduce your maintenance costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO Air Compressor Oils

FOR ALL OPERATING CONDITIONS

Faithfully yours

50

for Fifty Years